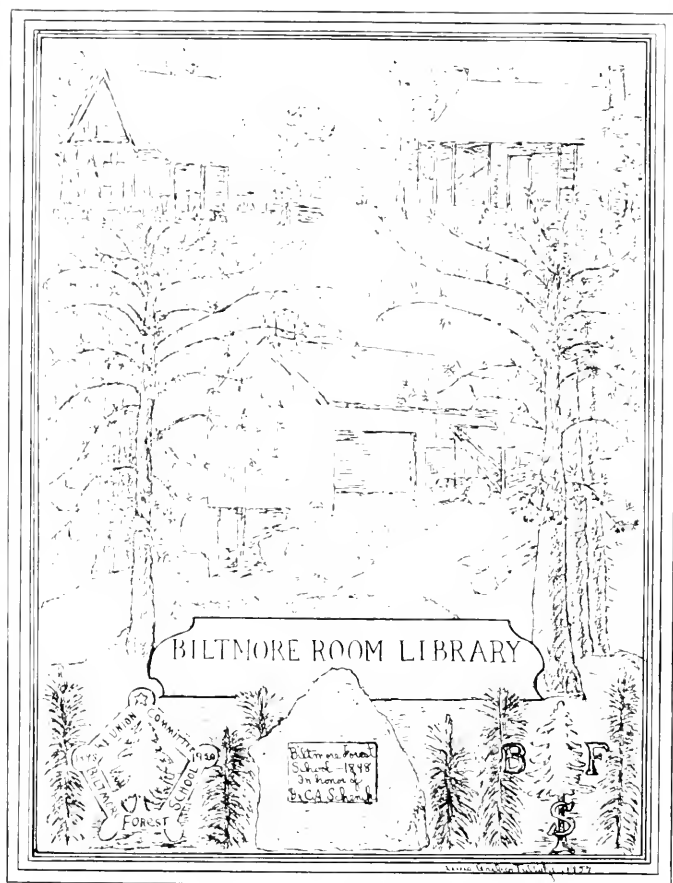


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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF FORESTRY.

# CHECK LIST

OF THE

# FOREST TREES OF THE UNITED STATES,

THEIR NAMES AND RANGES.

BY

**GEORGE B. SUDWORTH,**

*Dendrologist of the Division of Forestry.*

Issued November 5, 1898.

PREPARED UNDER THE DIRECTION OF

**B. E. FERNOW,**

*Chief of the Division of Forestry.*



WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1898.

11

11

*Corylus*  
*Alnus rigida*  
*Salix discolor*  
*Jasminum*

*Acer rubra.*  
*Jacchopanax*  
*Ulmus pubescens*  
*Am.*  
*Populus*  
*Betula*  
*Cercis Can.*  
*Cornus*

*Fraxinus*  
*Quercus*  
*Myrica*  
*Juniperus*  
*Platanus*  
*Rosa*  
*Robinia*  
*Quercus*  
*Jacchopanax*  
*Catalpa*  
*Aesculus*

*Castanea*  
*Rhus glabra*  
*Magnolia*  
*Liriodendron*  
*Ziba*

Oct.  
*Hamamelis*

## LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,  
 DIVISION OF FORESTRY,  
 Washington, D. C., March 7, 1898.

SIR: I have the honor to transmit herewith for publication a Check List of the Forest Trees of the United States, prepared by Mr. George B. Sudworth, Dendrologist of the Division.

It represents in the main a condensed reproduction of Bulletin No. 14, Nomenclature of the Arborescent Flora of the United States, by the same author, with notes on the distribution of trees added for better identification.

This shorter list, it is believed, will be helpful in bringing about a more uniform and stable use of names by lumbermen, nurserymen, and others interested in forest trees.

Respectfully,

B. E. FERNOW,  
 Chief of Division.

Hon. JAMES WILSON,  
 Secretary of Agriculture.

I Taxodiales = Taxodium <sup>distichum</sup> Sequoia - { sempervirens  
gigantia

II Cupressineae - Chamaecyparis Thuja Cupressus  
Sibbaldia Juniperus.

*Ipsoidea linear or awl shaped*

*Cupressinae - awl or awl shaped*

- I with petals *Cuspidata, Greggii, distala*
- II Without petals  
a seed flattened, wing broad & extending, tobo  
    *quadriangulata*  
    *Caroliniana, Floridiana*  
    *nigra*  
    *Anomala, profunda*
- b seed tetrahed.
1. *Zwiggii* *glabrous Americana Texensis Barlandi*  
    *Arizona*
2. *Zwiggii* *pubescent Pennsylvanica Washingtoni*  
    *longeolata (viridis) Biltmoreana, profunda*  
    *reticulata Chinensis*

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*Ericaceae*  
*Rhododendrons*

*Hybrid ergas*

I *Indian azaleas R. indicum*

II Ghent "(*R. flavum* x *R. luteum*) x *viscosum*"

(" " " ) x *rubriflorum*

(" " " ) x *Occidentale*

(" " " ) x *arborescens*

(leaves evergreen) III *Cantabrigiensis* { *Cantabrigiensis* x *pendulum* } x *arborescens*

IV *Javanese R.* { *Javanicum* x *maximum* } x *arborescens*  
    *Jasminiflorum* & other Malay shrubs

*Exobasidium* genus of fungus  
which causes bladder like swelling  
on rhododendron leaves.



## INTRODUCTION.

---

The first necessity for any forestry work is a knowledge of the trees which the forester is apt to meet in the forest, and again the first knowledge before he can think or talk of trees is that of their names.

While most of our forest trees are named both by botanists and laymen, a great number of entirely different kinds, or species, have received the same name, and also the same species has received a great number of names by which it is called in different parts of its range of occurrence. This confusion of names has led not only to many annoying inconveniences and misunderstandings, but often to fatal mistakes, as when a nurseryman fills an order with an entirely different kind of tree than was intended by the customer, or when a lumberman supplies an architect with an unsuitable material because their ideas as to what was ordered are at variance. Hence, the Division of Forestry has considered it a first duty to arrive at a uniform and stable nomenclature, both of scientific and vernacular names, by a revision of the existing names, or synonymy, in the hope that, while neither uniformity nor stability can be brought about by the mere publication of a list of names, such publication, carefully considered, might at least pave the way for such a desired end.

The botanical names have been revised according to certain laws now adopted by many botanists. The revision has been made by the competent Dendrologist of the Division, Mr. George B. Sudworth, and has been printed with a full synonymy and explanations in Bulletin No. 14 of this Division, Nomenclature of the Arborescent Flora of the United States. This bulky publication was, however, printed only in limited numbers, thereby preventing its widespread use. Since for practical uses it was not necessary to state the entire botanical synonymy, and in order to make the work more accessible, the present check list, being in part an abbreviated and amended reproduction of Bulletin No. 14, has been prepared.

For better identification, and in order to increase the value of the list, the geographical range of the species has been added in a few brief words.

The list of names comprises an enumeration of all the trees indigenous to the United States, 495 in number, the designation of "tree" being applied to all woody plants which produce naturally in their native habitat one main, erect stem bearing a definite crown, no matter what size they attain.

A few thoroughly naturalized trees are also noted, and natural or artificial varieties and hybrids have been fully cited.

Underneath the name adopted as correct according to the laws of nomenclature referred to, whenever a change has been made from the name usually found in current text-books, the text-book name is also given, in different type.

The selection of a vernacular name from the multitude of those in use is much more difficult, especially since the same name is often applied to many totally different trees. Thus, we have 12 Ironwoods, 16 Junipers, 6 Yellow Pines, 8 Balsams, etc., each referring to different species and often to different genera. There are also many species which have no vernacular name, not being recognized by the layman. There is no law upon the basis of which a selection could be made. The selection, therefore, had to be based on a few common-sense rules as a guide and with the principle of conservatism, the only rational one, in the foreground. A large number of correspondents were asked to submit lists of names in common use in various localities. Upon the basis of these lists the name used in the greatest number of localities has been given the preference unless it was also applied to some other tree, when, as an interference had to be avoided, either another name most commonly used or a name most descriptive and pertinent was selected. When possible, and where no vernacular names existed, a translation of the botanical name was taken, keeping, however, in mind the "name quality" of the combination, that is, a combination into the use of which as a name it would be natural to fall.

In some cases, where confusion or undesirable inconsistency was caused by one name serving different genera, an attempt at segregation without too much violence to well-established usage has been made, as, for instance, in the case of Cedar. This name is used indiscriminately for *Juniperus*, *Thuja*, *Chamaecyparis*, and *Libocedrus*. We have with consistency adopted the names Juniper for the first, Arborvitæ for the second, and Cedar for the last two, well aware that it may be difficult to overcome the objection of the logger's practice, at least to the name Arborvitæ.

To enable ready reference and pave the way for general adoption of these names, not only a complete index to all the common names in the list, but a full synonymy grouped by States is added, so that the layman or botanist can readily determine what plant probably is meant by the native.

Changes in practice can only come gradually and as the desirability for change appears; then what is sensible and adaptable will be adopted and what lacks in adaptability will fail of acceptance. This list, therefore, is to be considered only as a first step to improvement and will serve as basis for further work of this Division.

B. E. FERNOW.



## NOTE ON RANGE OF SPECIES.

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The first attempt in recent years to enumerate all of the North American trees (north of the Mexican boundary), with a description of their range and habitat, was made by Prof. C. S. Sargent, and the catalogue was published in a bulky volume (IX) of the Tenth Census (1884). The rapid increase of knowledge of American trees since then, however, has made many additions necessary, both as to newly discovered species and as to a better understanding of the range of many of those new or little known and also of the well-known species. The elaborate *Silva* of North America, which Professor Sargent has now nearly completed as a sequel and amplification, with botanical features, etc., of the Tenth Census catalogue, will be the most complete work issued, but from its high price it must unfortunately remain inaccessible to many.

Aside from these two works our best information concerning the number of species and range of North American trees is to be found chiefly in such regional works on botany as Gray's *Manual of Botany of the Northern States*, *Synoptical Flora of North America* (unfinished), Chapman's *Flora of the Southern States*, Coulter's *Manual of Rocky Mountain Botany and Botany of Western Texas*, and the *Botany of California*, by Sereno Watson and other collaborators; also, recently, the *Illustrated Flora of the United States and Canada*, by Britton and Brown. Other sources of information are found in the modest and often little known State and county catalogues of plants issued by local botanists, together with various articles scattered through American and foreign scientific journals and proceedings of scientific societies.

Moreover, the army of professional and amateur botanists engaged in botanical research are yearly bringing to light new facts, which are constantly enlarging our understanding of the geographical distribution of trees and other plants. But our knowledge of the range of tree species alone, especially since so vast a territory, with nearly 500 different species, has to be compassed, must long remain a variable quantity; and the sum total of facts concerning the geographical range of any of our trees must necessarily be an expression of the united efforts of all working botanists; for the unaided diligence of one man's lifetime could never carry his search and study into all of nature's hiding places for even trees alone. The geographical range notes presented in this volume are, therefore, drawn from all the reliable botanical publications available, supplemented by new facts personally gathered in recent field work.

In outlining the range of each species care has been taken, whenever reliable information was available, to indicate as exactly as possible points of limitation by the mention of counties, water courses, mountain systems, etc., and especially has this been aimed at in the case of new, rare, or little-known species. Wherever the range appears in more general terms specific information has not been at hand with which to give more definite limits. In the case of very common, widely, and continuously distributed species, however, the range often appears in somewhat general terms, for the reason that the ready detection of the species within the general lines renders more detailed delineation unnecessary.

A lack of space has excluded from the present catalogue any but occasional statements of the manner of occurrence of each species, that is, whether found in forests of pure growth, as in the case of Beech, Sugar Maple, White Oak, White Pine, etc., or as single individuals or scattered groups in a mixed growth, as is the case with the magnolias, basswoods, ashes, etc. Related and alike interesting facts which have been omitted are the special characters of soil, moisture, and altitude appearing to limit the natural occurrence of individuals to certain sites within a species' broader range; as, for example, the exclusive occupancy of low, mucky ground in the Northeast by the Tamarack, while the adjoining stiffer soils may bear Black Ash, with Red Maple and Yellow Birch, and the still drier contiguous upland soils may bear Red Oak, White Oak, Sugar Maple, etc.

Again, many trees are found to be more or less continuously distributed throughout their range, so that they are likely to be met with at frequent intervals. Thus, in traversing the territorial range of the familiar White Oak, individuals may be found in nearly every county and township, while less common species will be met with only in more widely separated stations, in some cases occurring as apparently accidental individuals. Peculiar, but usually accountable, phenomena are also seen in tree distribution where extensive areas of forest-forming species are very widely disconnected. A familiar example of this is the distribution of *Pinus palustris* in the Gulf region, where the species suddenly fades out east of the Mississippi River, but reappears again and in commercial quantities about 100 miles westward, in eastern Texas. Other less marked examples might be cited.

It is, therefore, to be understood by the layman that within the ranges, as stated in general terms, the species may be absent in many localities, and personal observation must aid the student to properly interpret the general range.

#### ADVENTIVE TREES.

In enumerating the indigenous trees of North America, it seems proper from time to time to include also certain exotic species which show the power of existing and spreading independently and without cultivation. Occurrence under such conditions may be taken as fairly indicative of

naturalization. Such trees as the poplars, willows, Ailanthus, etc., having been more or less extensively cultivated, have escaped and become widely and thoroughly naturalized. Still other exotics, such as the Paulownia, Paper Mulberry, Tallow-tree, etc., of less extensive adaptability to varying climatic conditions, have become naturalized in certain restricted regions. There are also many indigenous trees, such as locusts and catalpas, which, through wide cultivation, have largely increased the area of their distribution and become naturalized outside of their original range.

No systematic census of the actual range of such naturalized species in North America has been attempted in the present catalogue, the statements of their presence being often based upon more or less incomplete observations, but in all cases sufficient to warrant their introduction as associates of native species. Several cultivated exotic species, not included in the present catalogue, show a tendency to become naturalized. But the existence of such species seems for the most part to be confined to old and neglected grounds where, to a limited extent, the trees have become self-propagated, though hardly capable of advancing and holding their own against the vicissitudes of more exposed localities and other contestants for the soil. It is thought best, therefore, to exclude such trees till further observation proves them to be naturalized.

GEORGE B. SUDWORTH.

*See also in the list of trees  
the following species  
which have been introduced  
from Europe and Asia  
and are now naturalized  
in the State of New York.*



# CHECK LIST OF FOREST TREES OF THE UNITED STATES.

## GYMNOSPERMÆ.

### Family PINACEÆ.

#### *Res. nig. communis to Quebec, etc.* PINUS Linn.

#### **Pinus strobus** Linn.

#### **White Pine.**

RANGE.—From Newfoundland (White Bay region) and along the northern shores of St. Lawrence Gulf to northern Ontario (near Abitibi and Nipigon lakes) southern Manitoba (near southern end of Lake Winnipeg); southward through northern and eastern Minnesota, northeastern (Mitchell County) and eastern border of Iowa (to Scott County), northern (counties) Illinois, southern shores of Lake Michigan, southern Michigan (north of Allegan, Eaton, and St. Clair counties), northeastern and eastern (border counties) Ohio, and along the Allegheny Mountains to northern Georgia (Tallulah Falls).

NAMES IN USE.—White Pine (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., Ga., Ind., Ill., Wis., Mich., Minn., Ohio, Ont., Nebr.); Weymouth Pine (Mass., S. C.); Soft Pine (Pa.); Northern Pine (S. C.); Spruce Pine (Tenn.).

#### VARIETIES DISTINGUISHED IN CULTIVATION.

*Pinus strobus brevifolia* Loud.

*Pinus strobus umbraculifera* Knight.

*Pinus strobus minima* Beissn.

*Pinus strobus fastigiata* (Koch) Beissn.

*Pinus strobus viridis* Carr.

*Pinus strobus gracilifolia* Sudw.

*Pinus strobus nivea* (Knight) Carr.

*Pinus strobus aurea* Carr.

*Pinus strobus variegata* Carr.

*Pinus strobus zebrina* Beissn.

*Pinus strobus prostrata* Hort. Kew.

*Pinus strobus unifolia*<sup>1</sup> nom. nov.

#### **Pinus monticola** Dougl.

#### **Silver Pine.**

RANGE.—From Vancouver Island and southern British Columbia (coast and gold ranges) through northern Idaho (Cœur d'Alene and Bitter Root mountains) to northern Montana (Flathead River) and southward through Washington and Oregon (Cascade Mountains) to California (on Sierra Nevada Mountains to Calaveras County).

<sup>1</sup> *Pinus strobus unifolia* nom. nov. = *Pinus strobus forma nova monophylla* Tubeuf, in Forstl.-naturw. Zeitschr., VII., 34, (t.) 35, 1898, not *P. monophylla* Torr. & Frem. 1845. A form recently detected in Germany and characterized by Dr. Tubeuf as having the needles more or less cohering throughout their length and forming a single needle.

NAMES IN USE.—White Pine (Cal., Nev., Oreg.); Finger-cone Pine, (Cal.); Mountain Pine (Cal.); Soft Pine (Cal.); Little Sugar Pine (Cal.); Mountain Weymouth Pine; Western White Pine.

*gest*  
*to*  
*e* **Pinus lambertiana** Dougl.

**Sugar Pine.**

RANGE.—Coast region from Oregon (head of McKinzie and Rogue rivers) to California (Sierra Nevada Mountains and coast ranges to Santa Lucia Mountains; San Bernardino and Cuyamaca mountains).

NAMES IN USE.—Sugar Pine (Cal., Oreg.); Big Pine; Shade Pine (Cal.); Great Sugar Pine; Little Sugar Pine; Gigantic Pine (Cal. lit.); Purple coned Sugar Pine.

**Pinus flexilis** James.

**Limber Pine.**

RANGE.—Rocky Mountain region from Montana to western Texas (Guadalupe and Limpia mountains) and New Mexico; in mountains of northern Arizona, Utah, Nevada, and California (Inyo Mountains and Mount Sillman).

NAMES IN USE.—White Pine (Cal., Nev., Utah, Colo., N. Mex.); Pine (Utah, Mont.); Ball Pine (Colo.); Rocky Mountain White Pine (Cal.); Rocky Mountain Pine; Limber-twig Pine (Cal. lit.); Western White Pine (Cal. lit.); Arizona Flexilis Pine.

**Pinus albicaulis** Engelm.

**White-bark Pine.**

RANGE.—From British Columbia (coast ranges and Litasyouco River) southward and through Washington and Oregon (on Blue Mountains); eastward through northern Washington to northern Montana (eastern base Rocky Mountains); California (Sierra Nevada to San Bernardino mountains; Scotts Mountain and Mount Shasta).

NAMES IN USE.—White-stem Pine (Cal., Mont.); Scrub Pine (Mont.); Pitch Pine (Mont.); White-bark (Oreg.); White-bark Pine (Cal.); Creeping Pine (Cal. lit.); Alpine White-bark Pine (Cal. lit.).

**Pinus strobiformis** Engelm.

**Mexican White Pine.**

RANGE.—Southwestern New Mexico (mountains) to Arizona (Santa Rita and Santa Catalina mountains); mountains of Mexico and Guatemala.

NAMES IN USE.—Ayacahuite Pine; White Pine (Ariz.); Mexican White Pine; Arizona White Pine.

**Pinus quadrifolia** Parl.

**Parry Piñon.**

PINUS PARRYANA Engelm.

RANGE.—Southern California (San Diego County) and southward into Lower California.

NAMES IN USE.—Nut Pine (Cal.); Parry's Pine (Cal.); Parry's Nut Pine (Cal.); Parry Nut Pine (Cal. lit.); Piñon (Cal.); Mexican Piñon (Cal. lit.).

**Pinus cembroides** Zucc. *Seed* *from* *g.*

**Mexican Piñon.**

RANGE.—Arizona (Santa Catalina Mountains) and northern Mexico.

NAMES IN USE.—Nut Pine (Ariz., N. Mex.); Piñon (Mex.); Stone-seed Mexican Piñon (lit.); Mexican Cembra-like Pine (lit.).

**Pinus edulis** Engelm.

**Piñon.**

RANGE.—From Colorado (eastern base Pikes Peak) through New Mexico and to western Texas (mountains).

NAMES IN USE.—Piñon (Tex., Colo.); Nut Pine (Tex., Colo.); Piñon Pine (Colo.); New Mexican Piñon (lit.).

***Pinus monophylla* Torr. & Frem.****Single-leaf Piñon.**

RANGE.—From Utah (near Utah Lake) to California (eastern foothills Sierra Nevada Mountains) and southward into eastern Arizona (San Francisco Mountains).

NAMES IN USE.—Piñon (Cal., Ariz., Nev., Utah); Nut Pine (Cal., Ariz., Nev., Utah); Gray Pine (Nev.); Nevada Nut Pine (Cal.); Single-leaf (Cal. lit.); Fremont's Nut Pine (Cal. lit.).

***Pinus balfouriana* Murr.****Foxtail Pine.**

RANGE.—California (Scotts Mountain in Siskiyou County; Mount Whitney and sources of King and Kern rivers).

NAMES IN USE.—Spruce Pine (Cal. lit.); Foxtail Pine (Cal.).

***Pinus aristata* Engelm.****Bristle-cone Pine.**

RANGE.—From Colorado through southern Utah, northern Arizona, and Nevada to southeastern California.

NAMES IN USE.—Hickory Pine (Cal. lit.); Bristle-cone Pine (Cal. lit.); Foxtail Pine (Cal. lit.).

***Pinus resinosa* Ait.****Red Pine.**

RANGE.—From Newfoundland and along the northern shores of St. Lawrence Gulf to northern Ontario (north of Abitibi Lake) to southern Manitoba (near southern end of Lake Winnipeg); southward through the Northern States to Massachusetts (Middlesex County), Pennsylvania (Chester County), northeastern Ohio (north of Cleveland), central Michigan (Saginaw), northern Wisconsin (Oshkosh and Eau Claire), and northeastern Minnesota.

NAMES IN USE.—Red Pine (Vt., N. H., N. Y., Wis., Minn., Ont.); Norway Pine (Me., N. H., Vt., Mass., N. Y., Wis., Mich., Minn., Ont.); Hard Pine (Wis.); Canadian Red Pine (Eng.).

***Pinus torreyana* Parry.****Torrey Pine.**

RANGE.—Southern California (Soledad River in San Diego County).

NAMES IN USE.—Soledad Pine (Cal.); Del Mar Pine (Cal.); Lone Pine (Cal.); Torrey Pine (Cal. lit.); Torrey's Pine.

***Pinus arizonica* Engelm.****Arizona Pine.**

RANGE.—Southern Arizona (Chiricahua, Santa Catalina, El Rincon, and Santa Rita mountains).

NAMES IN USE.—Arizona Yellow Pine (Cal.); Arizona Pine; Arizona 5-leaved Lumber Pine (Cal. lit.).

***Pinus ponderosa* Laws.****Bull Pine.**

RANGE.—From British Columbia (interior south of latitude 51°), and Dakota (Black Hills region) southward in the Pacific and Rocky Mountain region to western Texas and Mexico.

NAMES IN USE.—Yellow Pine (Cal., Colo., Mont., Idaho, Utah, Wash., Oreg.); Bull Pine (Cal., Wash., Utah, Idaho, Oreg.); Big Pine (Mont.); Long-leaved Pine (Utah, Nev.); Red Pine; Pitch Pine; Southern Yellow Pine; Heavy-wooded Pine (Eng.); Western Pitch Pine; Heavy Pine (Cal.); Foothills Yellow Pine; Sierra Brownbark Pine; Montana Black Pine (Cal. lit.); "Gambier Parry's Pine" (Eng. lit.).

***Pinus ponderosa scopulorum* Engelm.****Rock Pine.**

RANGE.—Rocky Mountain region.

NAMES IN USE.—Yellow Pine (Mont., Nebr.); Bull Pine (Colo.); Long-leaved Pine (Colo.); Rocky Mountain Yellow Pine (lit.).

## VARIETY DISTINGUISHED IN CULTIVATION.

*Pinus ponderosa penduliformis* Sudw.

Weeping Bull Pine.

*Pinus apachea* Lemmon.

Apache Pine.

RANGE.—Southeastern Arizona (Chiricahua Mountains). Species insufficiently understood, and may prove to be a form of *P. ponderosa*.

*Pinus mayriana* Sudworth.

Arizona Long-leaf Pine.

PINUS LATIFOLIA Sarg., not of authors.

RANGE.—Southern Arizona (Santa Rita Mountains). Range insufficiently known.

NAMES IN USE.—Broad-leaf Pine (lit.); Arizona Broad-leaf Pine (lit.); Mayr Pine (lit.).

*Pinus jeffreyi* "Oreg. Com."

Jeffrey Pine.

RANGE.—California (Scotts Mountain in Siskiyou County and along Sierra Nevada Mountains to San Bernardino and San Jacinto mountains); Southern Oregon (Douglas County, 30 miles south of Roseburg).

NAMES IN USE.—Bull Pine (Cal.); Black Pine (Cal.); Western Black Pine (Cal. lit.); Pinos (Cal.); Truckee Pine (Nev.); Sapwood Pine (Cal.); Jeffrey Pine (Cal. lit.); Blackbark Pine (Cal. lit.); Redbark Pine (Cal. lit.); Peninsula Pine (Cal. lit.); Sierra Redbark Pine (Cal. lit.); Peninsula Black Pine (Cal. lit.).

*Pinus chihuahuana* Engelm.

Chihuahua Pine.

RANGE.—Southwestern New Mexico and Arizona (Santa Rita and San Francisco mountains) and southward in Mexico.

NAMES IN USE.—Chihuahua Top-cone Pine (Cal. lit.).

*Pinus contorta* Loud.

Shore Pine.

RANGE.—Coast region from Alaska to California (Mendocino County).

NAMES IN USE.—Scrub Pine; Knotty Pine; Tamarack (Cal.); Sand Pine (Oreg.); North Coast Scrub Pine (Cal. lit.); Bolander's Pine; Henderson's Pine.

*Pinus murrayana* "Oreg. Com."

Lodgepole Pine.

RANGE.—From Alaska (Yukon River) and southward through interior British Columbia; the mountains of Washington and Oregon to California (Sierra Nevada Mountains to San Jacinto Mountains); plateau east of the Rocky Mountains (latitude 56°) and south through the Rocky Mountain region to New Mexico and northern Arizona.

NAMES IN USE.—Tamarack (Wyo., Utah, Mont., Cal.); Prickly Pine (Utah); White Pine (Mont.); Black Pine (Wyo.); Lodgepole Pine (Wyo., Mont., Idaho); Spruce Pine (Colo., Idaho, Mont.); Tamarack Pine (Cal.); Murray Pine (Cal. lit.).

*Pinus sabiniana* Dougl.

Gray Pine.

RANGE.—California (Shasta County and southward in foothills of coast ranges and on western slopes of Sierra Nevada Mountains).

NAMES IN USE.—Sabine's Pine (Cal. lit.); Gray-leaf Pine (Cal. lit.).

*Pinus coulteri* Lamb.

Coulter Pine.

RANGE.—California (from Monte Diablo to Cuyamaca Mountains); possibly farther southward in Lower California.

NAMES IN USE.—Coulter's Pine (Cal.); Nut Pine (Cal.); Bigcone Pine (Cal.); Large-coned Pine (Eng. lit.).



***Pinus radiata* Don.****Monterey Pine**

*PINUS INSIGNIS* Douglas in herb. ex London.

RANGE.—California (Point Pinos on Monterey Bay, and along the coast from Pescadero to San Simeon Bay).

NAMES IN USE.—Monterey Pine (Cal.); Spreading-cone Pine (Cal. lit.); Nearly smooth-cone Pine (Cal. lit.); Remarkable Pine (Cal. lit.); Small-coned Monterey Pine (Cal. lit.); Two-leaved Insular Pine.<sup>1</sup>

***Pinus attenuata* Lemmon.****Knobcone Pine**

*PINUS TUBERCULATA* Gord.

RANGE.—Oregon (McKinzie River and south on western slopes of Cascade and Sierra Nevada mountains) to California (coast ranges from Santa Cruz to San Jacinto Mountains).

NAMES IN USE.—Knobcone Pine (Oreg., Cal.); Prickly-cone Pine (Idaho); Sun-loving Pine (Cal. lit.); Sunny-slope Pine (Cal. lit.); Narrow-cone Pine (Cal. lit.); Tuberculated-coned Pine (Eng. lit.).

***Pinus tæda* Linn.****Loblolly Pine.**

RANGE.—South Atlantic and Gulf States from New Jersey (Cape May), southern Delaware and West Virginia (Wood, Mineral, Hampshire, and Hardy counties) to central Florida (Cape Malabar and Tampa Bay) and west to eastern Texas (Colorado River; in Bastrop County); northward into southeastern Indian Territory, Arkansas, and southern border of middle and west Tennessee.

NAMES IN USE.—Loblolly Pine (Del., Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark.); Oldfield Pine (Del., Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark.); Torch Pine (Eng. lit.); Rosemary Pine (Va., N. C., in part); Slash Pine (Va., N. C., in part); Longschat Pine (Del.), Longshucks (Md., Va.); Black Slash Pine (S. C.); Frankincense Pine (lit.); Shortleaf Pine (Va., N. C., S. C., La.); Bull Pine (Texas and Gulf region); Virginia Pine; Sap Pine (Va., N. C.); Meadow Pine (Fla.); Cornstalk Pine (Va.); Black Pine (Va.); Foxtail Pine (Va., Md.); Indian Pine (Va., N. C.); Spruce Pine (Va., in part); Bastard Pine (Va., N. C.); Yellow Pine (north Ala., N. C.); Swamp Pine (Va., N. C.); Longstraw Pine (Va., N. C., in part).

***Pinus rigida* Mill.****Pitch Pine.**

RANGE.—From southern New Brunswick (St. Johns River) to eastern Ontario (north shore of Lake Ontario and Lower Ottawa River) and southward in the Atlantic region to southern Virginia (Norfolk) and along the mountains to northern Georgia (Atlanta); west to western New York (Ithaca), northeastern Pennsylvania, eastern Ohio (border counties south of Canton) and Kentucky, eastern Tennessee (to Cumberland Mountains).

NAMES IN USE.—Pitch Pine (Vt., N. H., Mass., R. I., Conn., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Ga., Ohio, Ont., Md., Eng.); Long-leaved Pine (Del.); Longschat Pine (Del.); Hard Pine (Mass.); Yellow Pine (Pa.); Black Pine (N. C.); Black Norway Pine (N. Y.); Rigid Pine (Eng. lit.); Sap Pine (lit.).

<sup>1</sup>Refers to the two-leaved form *Pinus radiata binata* (Engelm.) Lemm., found on Santa Rosa, Santa Cruz, and Guadaloupe islands.

***Pinus serotina* Michx.****Pond Pine.**

RANGE.—Coast region from North Carolina to Florida (head of St. Johns River, and probably farther south; on the west coast from Pensacola to Citrus County and probably much farther south). Range imperfectly known.

NAMES IN USE.—Marsh Pine (N. C.); Meadow Pine (N. C.); Pond Pine (N. C., S. C., Fla., Miss., La.); Loblolly Pine (N. C., Fla.); Spruce Pine (S. C., Ga.); Bastard Pine (S. C., Ga.); Bull Pine (S. C., Ga.).

***Pinus virginiana* Mill.****Scrub Pine.**

*PINUS INOPS* Solander ex Ait.

RANGE.—From New York (Staten Island) to South Carolina (Aiken River) and northern Alabama (Winston, Cullman, and Dekalb counties); west into southern Indiana, to middle Tennessee (Putnam County).

NAMES IN USE.—Jersey Pine (N. J., Pa., Del., N. C., S. C.); Scrub Pine (R. I., N. Y., Pa., Del., N. C., S. C., Ohio); Short Shucks (Md., Va.); Shortshat Pine (Del.); Spruce Pine (N. J., N. C.); Shortleaved (N. C.); Cedar Pine (N. C.); River Pine (N. C.); Nigger Pine (Tenn.); New Jersey Pine (lit.).

***Pinus clausa* (Engelm.) Sargent.****Sand Pine.**

RANGE.—Coast of Alabama (Baldwin County) and western Florida (to Pease Creek); east coast of Florida from St. Augustine to Halifax River.

NAMES IN USE.—Sand Pine (Fla., Ala.); Oldfield Pine (Fla.); Florida Spruce Pine (Ala.); Scrub Pine (Fla.); Spruce Pine (Fla.); Upland Spruce Pine (Fla.).

***Pinus pungens* Michx. f.****Table-mountain Pine.**

RANGE.—District of Columbia, Maryland, and Allegheny Mountain region from Pennsylvania to eastern and middle Tennessee and Georgia (Tallulah Falls).

NAMES IN USE.—Table mountain Pine (Pa., Del., Md., S. C.); Southern Mountain Pine (Tenn.); Prickly Pine (N. C.).

***Pinus muricata* Don.****California Swamp Pine.**

RANGE.—California coast (Fort Bragg, Mendocino County, and south in coast ranges to San Luis Obispo County); Lower California (Cedros Islands and coast of Escudo and San Quitan).

NAMES IN USE.—Swamp Pine (Cal.); Dwarf Marine Pine (Cal.); Prickle-cone Pine (Cal.); Bishop's Pine (Cal. and Eng. lit.); Anthony's Prickle cone Pine (Cal. lit.); Obispo Pine (Cal.).

***Pinus echinata* Mill.****Shortleaf Pine.**

*PINUS MITIS* Michx.

RANGE.—From New York (Staten Island) to Florida (Chattahoochee region) and west to southern Missouri, eastern Indian Territory, and northeastern Texas.

NAMES IN USE.—Yellow Pine (N. Y., N. J., Pa., Del., Va., N. C., Ala., Miss., La., Ark., Mo., Ill., Ind., Kans. (scarce), Ohio, Eng. lit.); Shortleaved Pine (N. C., S. C., Ga., Ala., Miss., Fla., La., Tex., Ark.); Spruce Pine (Del., Miss., Ark.); Bull Pine (Va.); Shortshat Pine (Del.); Pitch Pine (Mo.); Poor Pine (Fla.); Shortleaved Yellow Pine; Rosemary Pine (N. C.); Virginia Yellow Pine (Va., in part); North Carolina Yellow Pine (N. C. and Va., in part); North Carolina Pine (N. C. and Va., in part); Carolina Pine (N. C. and Va., in part); Slash Pine (N. C., Va., in part); Oldfield Pine (Ala., Miss.).

**Pinus glabra** Walt.**Spruce Pine.**

RANGE.—Coast region, from South Carolina (between latitude 31° and 33°) to Florida (Chattahoochee region) and west to Louisiana (Pearl River).

NAMES IN USE.—Spruce Pine (S. C., Ala., Fla.); Cedar Pine (Miss.); White Pine (S. C., Fla.); Walter's Pine (S. C.); Lowland Spruce Pine (Fla.); Poor Pine (Fla.); Kingstree (S. C.).

**Pinus divaricata** (Ait.) Du Mont de Cours.**Jack Pine.**

PINUS BANKSIANA Lamb. *sensitive to frost*  
 RANGE.—New Brunswick to New Hampshire and west through Great Lake and Hudson Bay (southern shores) region to Great Bear Lake, Mackenzie River, and Rocky Mountains; south into northern Maine, northern New York, northern Indiana and Illinois, and central Minnesota. *Bears C-100*

NAMES IN USE.—Scrub Pine (Me., Vt., N. Y., Wis., Mich., Minn., Ont.); Gray Pine (Vt., Minn., Ont.); Jack Pine (Mich., Minn., Canada); Princes Pine (Ont.); Black Jack Pine (Wis.); Black Pine (Minn.); Cypress (Quebec to Hudson Bay); Canada Horn-cone Pine (Cal. lit.); Chek Pine; Sir Joseph Bank's Pine (Eng.); "Juniper" (Canada); Banksian Pine (lit.).

**Pinus palustris** Mill.**Longleaf Pine.**

RANGE.—Coast region, from southern Virginia (Norfolk) to Florida (Tampa Bay and Cape Canaveral) to eastern Texas (Trinity River); northward in Alabama to the northeastern part of the State (Clay and Walker counties), and northwestern (border counties) Georgia. *Wonderful resistant*

NAMES IN USE.—Longleaved Pine (Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex.); Southern Pine (N. C., Ala., Miss., La.); Yellow Pine (Del., N. C., S. C., Ala., Fla., La., Tex.); Turpentine Pine (N. C.); Rosemary Pine (N. C.); Brown Pine (Tenn.); Hard Pine (Ala., Miss., La.); Georgia Pine (general, Del.); Fat Pine (Southern States); Southern Yellow Pine (general); Southern Hard Pine (general); Southern Heart Pine (general); Southern Pitch Pine (general); Heart Pine (N. C. and South Atlantic region); Pitch Pine (Atlantic region); Longleaved Yellow Pine (Atlantic region); Longleaved Pitch Pine (Atlantic region); Longstraw Pine (Atlantic region); North Carolina Pitch Pine (Va., N. C.); Georgia Yellow Pine (Atlantic region); Georgia Heart Pine (general); Georgia Longleaved Pine (Atlantic region); Georgia Pitch Pine (Atlantic region); Florida Yellow Pine (Atlantic region); Florida Pine (Atlantic region); Florida Longleaved Pine (Atlantic region); Texas Yellow Pine (Atlantic region); Texas Longleaved Pine (Atlantic region). *Every body knows*

**Pinus heterophylla** (Ell.) Sudworth.**Cuban Pine.**

## PINUS CUBENSIS Griseb.

RANGE.—Coast region (60 to 100 miles inland), from South Carolina (Charleston) to southern Florida (Cape Canaveral and Biscayne Bay) and west to Louisiana (Pearl River). *Cavifolia*

NAMES IN USE.—Slash Pine (Ala., Miss., Ga., Fla.); Swamp Pine (Fla., Miss., Ala., in part); Bastard Pine (Ala. lumbermen, Fla.); Meadow Pine (Fla., eastern Miss., in part); Pitch Pine (Fla.); She Pitch Pine (Ga.); She Pine (Ga., Fla.); Spruce Pine (southern Ala.).

**LARIX** Duham.**Larix laricina** (Du Roi) Koch.**Tamarack.****LARIX AMERICANA** Michx.

RANGE.—From Newfoundland and Labrador to northern Pennsylvania, northern Indiana, Illinois, central Minnesota, and northwestward to Hudson Bay (Cape Churchill, Great Bear Lake, and Mackenzie River) (in Arctic Circle).

NAMES IN USE.—Larch (Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Wis., Minn., Ohio, Ont., Minn.); Tamarack (Me., N. H., Vt., Mass., R. I., N. Y., N. J., Pa., Ind., Ill., Wis., Mich., Minn., Ohio, Ont.); Hackmatack (Me., N. H., Mass., R. I., Del., Ill., Minn., Ont.); American Larch (Vt., Wis., nurserymen); Juniper (Me., N. Bruns. to Hudson Bay); Black Larch (Minn.); Epinette Rouge (Quebec): Ka neh-tens="The leaves fall" (Indians, N. Y.); Red Larch (Mich.); Hackmack (lit.).

**Larix occidentalis** Nutt.**Western Larch.**

RANGE.—Southern British Columbia (south of latitude 53°) and south in the Cascade Mountains to the Columbia River, and to western Montana; also in Blue Mountains of Washington and Oregon.

NAMES IN USE.—Tamarack (Oreg.); Hackmatack; Larch (Idaho, Wash., etc.); Red American Larch; Western Tamarack; Great Western Larch (Cal. lit.); Western Larch (Eng.)

**Larix lyallii** Parl.**Alpine Larch.**

RANGE.—High mountains (6,000 to 7,000 feet) of northwestern States, from Montana to Washington and Oregon, and northward in adjacent territory. Range imperfectly known.

NAMES IN USE.—Tamarack (Idaho, Wash., Oreg.); Larch (Idaho, Wasa., Oreg.); Mountain Larch; Lyall's Larch (lit.); Woolly Larch (Cal. lit.).

**PICEA** Link.**Picea mariana** (Mill.) B. S. P.**Black Spruce.****PICEA NIGRA** Link.

RANGE.—Newfoundland to Hudson Bay and northwestward to the Mackenzie River; southward in Michigan, Wisconsin, Minnesota, and in the eastern mountains to North Carolina and Tennessee.

NAMES IN USE.—Black Spruce (N. H., Vt., Mass., R. I., N. Y., Pa., W. Va., N. C., S. C., Wis., Mich., Minn., Ont., Eng.); Double Spruce (Me., Vt., Minn.); Blue Spruce (Wis.); Spruce (Vt.); White Spruce (W. Va.; Yew Pine (W. Va.); Juniper (N. C.); Spruce Pine (W. Va., Pa.); H<sub>2</sub> Balsam (Del., N. C.); Epinette Jaune (Quebec); Water Spruce (Canada, Me.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Picea mariana doumetti** (Carr.) Beissn.**Picea mariana pumila** (Carr.) Sudw.**Picea mariana humilis** Sudw.**Picea mariana argenteo-variegata** (Beissn.) Sudw.**Picea mariana aurescens** Sudw.**Picea mariana albescens** Sudw.

**Picea rubens** Sargent.**Red Spruce.**

PICEA RUBRA Diet.

RANGE.—Nova Scotia to North Carolina and Tennessee. Range imperfectly known.

NAMES IN USE.—Red Spruce; Yellow Spruce (N. Y.); North American Red Spruce (foreign lit.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Picea rubens cœrulea** (Loud.) nom. nov.

PICEA RUBRA CÆRULEA (Loud.) Forbes.

**Picea rubens pendula** (Carr.) nom. nov.

PICEA RUBRA PENDULA Carr.

**Picea rubens gracilis** (Knight) nom. nov.

PICEA RUBRA GRACILIS (Knight) Carr.

**Picea canadensis** (Mill.) B. S. P.**White Spruce.**

PICEA ALBA Link.

RANGE.—Newfoundland to Hudson Bay and northwestward to Alaska; southward to northern New York, Michigan, Wisconsin, Minnesota, South Dakota, Montana, and British Columbia.

NAMES IN USE.—White Spruce (Vt., N. H., Mass., N. Y., Wis., Mich., Minn., Ont.); Single Spruce (Me., Vt., Minn.); Bog Spruce (New Eng.); Skunk Spruce (Wis., Me., New Eng., Ont.); Cat Spruce (Me., New Eng.); Spruce (Vt.), Pine (Hudson Bay); Double Spruce (Vt.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Picea canadensis glauca** (Moench.) Sudw.**Picea canadensis acutissima** (Beissn.) Sudw.**Picea canadensis compressa** (Beissn.) Sudw.**Picea canadensis nana** (Loud.) Sudw.**Picea canadensis nana glaucifolia** Sudw.**Picea canadensis echinoformis** (Carr.) Sudw.**Picea canadensis compacta gracilis** (Beissn.) Sudw.**Picea canadensis compressiformis** Sudw.**Picea canadensis nutans** Sudw.**Picea canadensis aurea** (Beissn.) Sudw.**Picea engelmanni**<sup>1</sup> Engelm.**Engelmann Spruce.**

RANGE.—Northern Arizona and through the Rocky Mountain region to British Columbia.

NAMES IN USE.—Engelmann's Spruce (Utah); Balsam (Utah); White Spruce (Oreg., Colo., Utah, Idaho); White Pine (Idaho); Mountain Spruce (Mont.); Arizona Spruce (Cal. lit.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Picea engelmanni griseifolia** Sudw.**Picea engelmanni argyrophylla** Sudw.**Picea engelmanni minutifolia** Sudw.**Picea parryana** (André) Parry.**Blue Spruce.**

PICEA PUNGENS Engelm.

RANGE.—Central Rocky Mountain region—Colorado, Utah, and Wyoming.

NAMES IN USE.—Parry's Spruce (Utah); Blue Spruce (Colo.); Spruce; Balsam (Colo., Utah); White Spruce (Utah, Colo.); Silver Spruce (Colo.); Colorado Blue Spruce (Colo.); Prickly Spruce (lit.)

<sup>1</sup>Prof. J. G. Lemmon has recently described the following as distinct from the Engelmann Spruce: *Picea columbiana* Lemm. (= *P. engelmanni* Engelm. in part).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Picea parryana glaucescens** nom. nov.

PICEA PUNGENS GLAUDESCENS Sudw.

**Picea parryana cyanea** nom. nov.

PICEA PUNGENS CYANEA Sudw.

**Picea parryana argentea** (Beissn.) nom. nov.

PICEA PUNGENS ARGENTEA Beissn.

**Picea parryana glauca pendens** nom. nov.

PICEA PUNGENS GLAUCA PENDENS Sudw.

**Picea sitchensis** (Bong.) Trautv. & Mayer.**Sitka Spruce.**

RANGE.—Coast region (extending inland about 50 miles) from Alaska to northern California (Mendocino County).

NAMES IN USE.—Tideland Spruce (Cal., Oreg., Wash.); Menzies' Spruce; Western Spruce; Great Tideland Spruce (Cal. lit.).

**Picea breweriana** Wats.**Weeping Spruce.**

RANGE.—Northern California (Siskiyou Mountains), very local, and southern Oregon.

NAMES IN USE.—Weeping Spruce; Brewer's Spruce; Siskiyou Spruce (Germ. lit.).

**TSUGA** Carr.**Tsuga canadensis** (Linn.) Carr.**Hemlock.**

RANGE.—Nova Scotia to Minnesota (Carleton County), Wisconsin, Michigan, and southward in the Atlantic region along the mountains to northern Alabama (Winston County) and Georgia.

NAMES IN USE.—Hemlock (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., N. C., S. C., Ky., Wis., Mich., Minn., Ohio, Ont.); Hemlock Spruce (Vt., R. I., N. Y., Pa., N. J., W. Va., N. C., S. C., England, cult.); Spruce (Pa., W. Va.); Spruce Pine (Pa., Del., Va., N. C., Ga.); Oh-nch-tah="Greens on the stick" (N. Y. Indians); Canadian Hemlock (lit.); New England Hemlock (lit.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Tsuga canadensis pumila** Sudw.**Tsuga canadensis compacta minima** Sudw.**Tsuga canadensis globosa** Beissn.**Tsuga canadensis gracilis** Carr.**Tsuga canadensis milfordensis** Nichol.**Tsuga canadensis erecta** Sudw.**Tsuga canadensis columnaris** Beissn.**Tsuga canadensis macrophylla** Beissn.**Tsuga canadensis paucifolia** Sudw.**Tsuga canadensis microphylla** Beissn.**Tsuga canadensis parvifolia** (Veitch) Beissn.**Tsuga canadensis pendula** Beissn.**Tsuga canadensis aurea** Beissn.**Tsuga canadensis albo-spica** (Gord.) Beissn.**Tsuga canadensis argenteo-variegata** Sudw.**Tsuga canadensis argentifolia** Sudw.

***Tsuga caroliniana* Engelm.****Carolina Hemlock.**

RANGE.—Mountains of southwestern Virginia, western North Carolina, and northern Georgia; very local.

NAMES IN USE.—Hemlock (N. C., S. C.); Southern Hemlock (lit.).

***Tsuga heterophylla* (Raf.) Sargent.****Western Hemlock.**

*TSUGA MERTENSIANA* authors, not Carr.

RANGE.—Alaska to Idaho and Montana and southward (in the Cascade and coast ranges) to California (Marin County).

NAMES IN USE.—Hemlock Spruce (Cal.; Western Hemlock (Cal.); Hemlock (Oreg., Idaho, Wash.); Western Hemlock Spruce (lit.); California Hemlock Spruce; Western Hemlock Fir (Eng.); Prince Albert's Fir (Eng.); Alaska Pine (Northwestern lumbermen).

## VARIETY DISTINGUISHED IN CULTIVATION.

*Tsuga heterophylla latifolia* nom. nov.

*TSUGA MERTENSIANA LATIFOLIA* Sudw.

***Tsuga mertensiana* (Bong.) Carr.****Black Hemlock.**

*TSUGA PATTONIANA* (Jeffr.) Engelm.

RANGE.—Northern British Columbia to Idaho and northern Montana, and southward to California (Sierra Nevada Mountains); usually above 10,000 feet; at sea level only in region of Sitka.

NAMES IN USE.—Williamson's Spruce (Cal.); Weeping Spruce (Cal.); Alpine Spruce (Cal.); Hemlock Spruce (Cal.); Patton's Spruce; Alpine Western Spruce.

***Tsuga mertensiana hookeriana* (Carr.) nom. nov. Hooker Hemlock.**

*TSUGA PATTONIANA HOOKERIANA* (Carr.) Lemmon.

## VARIETY DISTINGUISHED IN CULTIVATION.

*Tsuga mertensiana argentea* (Beissn.) nom. nov.

*TSUGA PATTONIANA ARGENTEA* Beissn.

***PSEUDOTSUGA* Carr.*****Pseudotsuga taxifolia*<sup>1</sup> (Lam.) Britton.****Douglas Spruce.**

*PSEUDOTSUGA DOUGLASHI* Carr.

RANGE.—From the Rocky Mountain region (in United States) and northward to central British Columbia; Pacific coast.

NAMES IN USE.—Red Fir (Oreg., Wash., Idaho, Utah, Mont., Colo.); Douglas Spruce (Cal., Colo., Mont.); Douglas Fir (Utah, Oreg., Colo.);

<sup>1</sup> DOUGLAS SPRUCE (*Pseudotsuga taxifolia* vs. *Pseudotsuga mucronata*).—The retention of the specific term *taxifolia* in the genus *Pseudotsuga* is held by some botanists to be at variance with the meaning of the law excluding the use of synonyms and homonyms. Lambert first described the Douglas Spruce as *Pinus taxifolia* (*Pinus* ed. 1, 51, t. 33) in 1803, not knowing that in 1796 Salisbury had already described another coniferous tree, a true fir and now known as *Abies balsamea* (L.) Mill., as *Pinus taxifolia*. At this point, according to botanical laws now observed, the Douglas Spruce was without a name, since supposing the tree to be a true pine, there could exist but one *Pinus taxifolia* and that one only the earlier, or *Pinus taxifolia* Salisbury (1796). So far as is known Poiret (in Lamarck, Enc. Méth. Bot., vi, 523) was the next to describe this tree in 1804, under the following designation: "*Abies taxifolia* Lambert." But as we know Lambert did not write "*Abies taxifolia*," but *Pinus taxifolia*,

Yellow Fir (Oreg., Mont., Idaho, Wash.); Spruce (Mont.); Fir (Mont.); Oregon Pine (Cal., Wash., Oreg.); Red Pine (Utah, Idaho, Colo.); Puget Sound Pine (Wash.); Douglas-tree; Cork-barked Douglas Spruce (var. *suberosa* Lemm.).

***Pseudotsuga taxifolia pendula* (Engelm.) Sudworth.**

**Weeping Douglas Spruce**

VARIETIES DISTINGUISHED IN CULTIVATION.

*Pseudotsuga taxifolia pendula cærulea* Sudw.

*Pseudotsuga taxifolia glauca* (Beissl.) Sudw.

*Pseudotsuga taxifolia fastigiata* (Knight) Sudw.

the *Abies taxifolia* must be taken as original with Poiret, and is the first name in the plant's history which could be considered tenable, as there is none other like it in form. Rafinesque, however, subsequently described the Douglas Spruce under still another name, *Abies mucronata* (Atl. Journ., 120, 1832), which brings us to the point of controversy.

Now, this tree at present being considered a *Pseudotsuga*, should bear its earliest specific name in combination. It is here maintained that this combination should be *Pseudotsuga taxifolia* (Poir.) Britton, founded on the first tenable name applied to the plant, that is, *Abies taxifolia* Poiret (l. c.). It is held by others, however, that *Pseudotsuga mucronata* (Raf.) Sudworth should be maintained, as I myself did at one time, to the exclusion of *Pseudotsuga taxifolia*. Those opposing the use of the latter name base their objection on the argument that it is founded on a synonym (*Abies taxifolia*) derived from the homonym *Pinus taxifolia* Lambert (1803), which is, to be sure, invalidated by *Pinus taxifolia* Salisbury (1796). Clearly *Pinus taxifolia* Lambert (1803) is an inert name to which no derivative reference can be made. The supposition, however, that *Abies taxifolia* Poiret (1804), being founded or derived by Poiret from the homonym *Pinus taxifolia* Lambert, renders the former name untenable, is believed to be an entirely erroneous interpretation of the meaning of the law touching this mooted question. For, so far as is known, and independent of its supposed derivation, *Abies taxifolia* Poiret (1804) is the first name in form of its kind proposed, and is therefore inviolable. Moreover, the proof that *Abies taxifolia* Poiret is actually derived from the homonym *Pinus taxifolia* Lambert, and therefore untenable, is faulty, because Lambert is quoted (by Poiret, l. c.) as writing what he did not write. But from still another point of view and disregarding the taxonomic relationship of *Pseudotsuga taxifolia* with *Abies taxifolia* Poiret, were *Pseudotsuga taxifolia* not now in existence, no one could deny that according to present practice the name could be created and applied for any other species of *Pseudotsuga*. It must stand because it would be the first and only one of its type published. For the same reason the specific term *taxifolia* seems perfectly tenable for the Douglas Spruce, as it conflicts with no other like specific or varietal term in the genus *Pseudotsuga*.

It would appear that the essential point in the application of the law preventing the use of duplicate or synonymous names and terms should be strictly a mechanical one, regardless of any synthetic relationship which may exist between names.

Prof. J. G. Lemmon has proposed the following varieties of the Douglas Spruce, which are as yet unknown to me in nature:

*Pseudotsuga taxifolia* var. *suberosa* Lemm.—Small tree, distinguished by its thick, corky bark, thin foliage, and small ovate cones, 1 to 2 inches long, and found on the principal mountains of northern Arizona and New Mexico.

*Pseudotsuga taxifolia* var. *longata* Lemm.—Distinguished by its "comparatively thin, whitish (outside), shallow-furrowed bark and conspicuous, long, narrow, yellowish, shiny cones, 3½ to 4½ inches long and one-fifth as thick, with comparatively short bracts and thin, soft scales." Found at base of Mount Hood, Oregon.

*Pseudotsuga mucronata* var. *palustris* Lemm (= *Abies mucronata* var. *palustris* Raf.).—Rafinesque founded this form on the following: "Grows in swamps, only 30 feet high, and with spreading branches." Said to occur in the region of the lower Columbia River.



*Pseudotsuga taxifolia standishiana* (Gord.) Sudw.  
*Pseudotsuga taxifolia dumosa* (Carr.) Sudw.  
*Pseudotsuga taxifolia compacta* (Beissn.) Sudw.  
*Pseudotsuga taxifolia elegans* (Beissn.) Sudw.  
*Pseudotsuga taxifolia argentea* (Beissn.) Sudw.  
*Pseudotsuga taxifolia argentea densa* Sudw.  
*Pseudotsuga taxifolia variegata* (McDon.) Sudw.  
*Pseudotsuga taxifolia stairi* (Beissn.) Sudw.  
*Pseudotsuga taxifolia brevifolia* (Hort. Kew.) Sudw.  
*Pseudotsuga taxifolia revoluta* (Hort. Kew.) Sudw.

***Pseudotsuga macrocarpa* (Torr.) Mayr.**

**Bigcone Spruce**

RANGE.—Southern California (San Bernardino Mountains to the Cuyamaca Mountains).

NAMES IN USE.—Spruce (Cal.); Hemlock (Cal.); Bigcone Spruce (lit.); Bigcone Douglas Spruce (lit.).

***ABIES* DuRoi.**

***Abies fraseri* (Pursh) Lindl.**

**Fraser Fir.**

RANGE.—Mountains of North Carolina and Tennessee.

NAMES IN USE.—Balsam (N. C., Tenn.); Balsam Fir (N. C.); Double Fir Balsam (Tenn.); Double Spruce (N. C.); She Balsam (N. C.); She Balsam Fir (N. C.); Mountain Balsam (N. C.); Healing Balsam.

***Abies balsamea* (Linn.) Mill.**

**Balsam Fir.**

RANGE.—From Newfoundland and Labrador to Hudson Bay and northwestward to Great Bear Lake region, and south to Pennsylvania (and along high mountains to Virginia), Michigan, and Minnesota.

NAMES IN USE.—Balsam Fir (N. H., Vt., Mass., R. I., N. Y., Pa., W. Va., Wis., Mich., Minn., Nebr., Ohio, Ont.; Eng. cult.); Balsam (Vt., N. H., N. Y.); Canada Balsam (N. C.); Balm of Gilead (Del.); Balm of Gilead Fir (N. Y., Pa.); Blister Pine (W. Va.); Fir Pine (W. Va.); Fir-tree (Vt.); Single Spruce (N. Bruns. to Hudson Bay); Silver Pine (Hudson Bay); Sapin (Quebec); Cho-koh-tung—"Blisters" (N. Y. Indians).

VARIETIES DISTINGUISHED IN CULTIVATION.

*Abies balsamea hudsonia* (Knight) Veitch.

*Abies balsamea brachylepis* Willk.

*Abies balsamea longifolia* (Loud.) Endl.

*Abies balsamea cærulea* Carr.

*Abies balsamea hemisphærica* Sudw.

*Abies balsamea prostrata* (Knight) Carr.

*Abies balsamea paucifolia* Sudw.

*Abies balsamea nudicaulis* Carr.

*Abies balsamea versicolor* Sudw.

*Abies balsamea argentifolia* Sudw.

***Abies lasiocarpa* (Hook.) Nutt.**

**Alpine Fir.**

RANGE.—Rocky Mountain region from Colorado to Montana and Idaho, and westward through northern Oregon and northward to Alaska (latitude 60°).

NAMES IN USE.—Sub-Alpine Fir (Utah); Balsam (Colo., Utah, Idaho, Oreg.); White Fir (Idaho, Mont.); White Balsam; Oregon Balsam tree

(Cal.); Pumpkin-tree; Alpine Fir; Mountain Balsam (mountains of Utah and Idaho); Down-cone Fir (lit.); Downy-cone Sub-Alpine Fir (Cal. lit.).

VARIETY DISTINGUISHED IN CULTIVATION.

*Abies lasiocarpa cærulescens* (Beissn.) Sudw.

*Abies arizonica* Merriam.

**Arizona Cork Fir.**

RANGE.—At present known only from Arizona (San Francisco Mountains).

*Abies grandis* Lindl.

**Lowland Fir.**

RANGE.—Coast region from Vancouver Island to California (Mendocino County), and from Washington and Oregon to northern Idaho and Montana.

NAMES IN USE.—White Fir (Cal., Oreg., Idaho); Silver Fir (Mont., Idaho); Yellow Fir (Mont., Idaho); Oregon White Fir (Cal.); Western White Fir; Grand or Oregon White Fir (Cal. lit.); Great California Fir (lit.).

VARIETIES DISTINGUISHED IN CULTIVATION.

*Abies grandis aurifolia* Sudw.

*Abies grandis crassa* Sudw.

*Abies concolor* (Gord.) Parry.

**White Fir.**

RANGE.—Oregon (Siskiyou Mountains) to southern California (San Bernardino County); northern Arizona and New Mexico to Colorado and Utah (Wasatch Mountains).

NAMES IN USE.—White Fir (Cal., Idaho, Utah, Colo.); Balsam Fir (Cal., Idaho, Colo.); Silver Fir (Cal.); Balsam (Cal.); White Balsam (Utah); Bastard Pine (Utah); Balsam tree (Idaho); Black Gum (Utah); California White Fir (Cal.); Colorado White Fir (Cal. lit.); Concolor Silver Fir (Eng. lit.).

VARIETIES DISTINGUISHED IN CULTIVATION.

*Abies concolor pendens* (Beissn.) Sudw.

*Abies concolor varia* Sudw.

*Abies concolor purpurea* Sudw.

*Abies concolor purpurea compressa* Sudw.

*Abies concolor angustata* Sudw.

*Abies concolor lowiana* (Murr.) Lemmon.

**Pale-leaf White Fir.**

RANGE.—California (Sierra Nevada Mountains) and southern Oregon (Siskiyou Mountains).

NAMES IN USE.—Pale-leaved White Fir (Cal. lit.); California White Fir.

*Abies venusta* (Dougl.) Koch.

*styl. leaflet. 24*

**Bristle-cone Fir.**

RANGE.—Southern California (Santa Lucia Mountains) on the northern boundary of San Luis Obispo County and 40 miles northward).

NAMES IN USE.—Fringed Spruce, Bristle-cone Fir (Cal.); Santa Lucia Fir (Eng. lit.).

*Abies amabilis* (Loud.) Forb.

**Amabilis Fir.**

RANGE.—From British Columbia (Fraser River and southward in the Cascade Mountains) to Washington and Oregon.

NAMES IN USE.—Red Fir; Red Silver Fir (Western Mountains); Fir (Cal.); Lovely Red Fir (Cal. lit.); Lovely Fir (Cal. lit.); Amabilis or Lovely Fir (Cal. lit.); "Larch" (Oreg. lumbermen).

**Abies nobilis** Lindl.*heavy & strong wood***Noble Fir.**

RANGE.—Washington (coast mountains in southwestern part of State; Olympic Mountains on Soldue River; from Mount Baker southward in the Cascade Mountains) to Oregon (Browder Ridge on head waters of McKinzie River in Lane County). Range at present but little known.

NAMES IN USE.—Red Fir (Oreg.); "Larch" (Oreg. lumbermen); Noble Fir (Oreg.); Bigtree; Feather-cone Red Fir (Cal. lit.); Noble or Bracted Red Fir (Cal. lit.); Tuck Tuck (Pacific Indians).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Abies nobilis glaucifolia** Sudw.**Abies nobilis robustifolia** Sudw.**Abies shastensis** Lemmon.**Shasta Fir.**

RANGE.—Southern Oregon (Cascade Mountains) and California (Mount Shasta, Mount Eddy, Trinity Mountain, Scotts Mountain). Range as yet insufficiently understood.

NAMES IN USE.—Shasta Red Fir (Cal. lit.); Shasta Fir (Cal. lit.).

**Abies magnifica** Murr.*heavy & strong wood***Red Fir.**

RANGE.—California (Mount Shasta and along the western slopes of Sierra Nevada, Mountains).

NAMES IN USE.—Red Fir (Cal.); California Red-bark Fir (Cal.); Magnificent Fir (Cal. lit.); California Red Fir (Cal. lit.); Golden Fir (Cal. lit.).

*Eastern firs non-durable.*

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Abies magnifica cyanea** Sudw.**Abies magnifica xanthocarpa** Lemmon.**Yellow-fruit Fir.****TAXODIUM** Rich.**Taxodium distichum** (Linn.) Rich.**Bald Cypress.**

RANGE.—From southern Delaware (Sussex County and southward in the coast region) to Florida (Mosquito Inlet and Cape Romano); westward in the Gulf coast region to Texas (Devils River) and northward through Louisiana, Arkansas, and eastern Mississippi and Tennessee, southeastern Missouri, western and northwestern Kentucky, southern Illinois, and southwestern Indiana (Knox County).

NAMES IN USE.—Bald Cypress (Del., N. C., S. C., Ala., La., Fla., Tex., Ark., Mo., Ill., Ind.); White Cypress (N. C., S. C., Fla., Miss.); Black Cypress (N. C., S. C., Ala., Tex.); Red Cypress (Ga., Miss., La., Tex.); Swamp Cypress (La.); Cypress (Del., N. C., S. C., Fla., Miss., Ky., Mo., Ill.); Deciduous Cypress (Del., Ill., Tex.); Southern Cypress (Ala.)

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Taxodium distichum pendulum** (Forb.) Carr.**Taxodium distichum pendulum elegans** Beissn.**Taxodium distichum pendulum novum** Beissn.**Taxodium distichum patens** (Ait.) Endl.**Taxodium distichum denudatum** Carr.**Taxodium distichum imbricarium** (Nutt.) Sarg.**Taxodium distichum knighti** Carr.**Taxodium distichum pyramidatum** Carr.

*Taxodium distichum microphyllum* (Brong.) Henk. and Hochst.

*Taxodium distichum intermedium* Carr.

*Taxodium distichum nanum* Carr.

*Taxodium distichum nigrum* Gord.

## SEQUOIA Endl.

*Sequoia washingtoniana*<sup>1</sup> (Winsl.) Sudworth.

**Bigtree.**

*SEQUOIA GIGANTEA* Decaisne.

RANGE.—California (from latitude 39° to a little south of latitude 36°, that is, from middle fork of American River and along the western slope of Sierra Nevada Mountains to the head waters of Deer Creek).

NAMES IN USE.—*Sequoia* (Cal.); *Bigtree* (Cal.); *Giant Sequoia* (Cal.); *Mammoth-tree* (Cal., and in Eng. cult.)

### VARIETIES DISTINGUISHED IN CULTIVATION.

*Sequoia washingtoniana pendula* (Beissn.) Sudw.

*Sequoia washingtoniana glauca* (Gord.) Sudw.

*Sequoia washingtoniana aurea* (Beissn.) Sudw.

*Sequoia washingtoniana argentea* (Beissn.) Sudw.

*Sequoia washingtoniana variegata* (Gord.) Sudw.

*Sequoia washingtoniana holmsi* (Beissn.) Sudw.

*Sequoia washingtoniana glaucescens pyramido-compacta* Sudw.

*Sequoia washingtoniana pygmaea* (Beissn.) Sudw.

*Sequoia sempervirens* (Lamb.) Endl.

**Redwood.**

RANGE.—From the southern borders of Oregon (on Clatsop River, about 6 miles from mouth, and on Winchuck River), and southward in the coast region (20 to 30 miles inland) through California (to Salmon Creek Canyon, 12 miles south of Punta Gorda, Monterey County).

NAMES IN USE.—*Redwood* (Cal. and Am. lit.); *Sequoia* (Cal.); *Coast Redwood* (Cal.); *California Redwood* (Eng. lit.).

<sup>1</sup> **BIGTREE** (*Sequoia wellingtonia* vs. *Sequoia washingtoniana*).—It is held by some botanists that since the long-used name for this tree, *S. gigantea*, is now excluded (for reasons shown below), *S. wellingtonia* is the next tenable name, and the really older name *S. washingtoniana* should be neglected because thought not to be technically established. The first name applied to this tree is *Wellingtonia gigantea* Lindley (London Gard. Chron., 820, 823, 1853). The second name is *Sequoia gigantea* Decaisne (Bull. Bot. Soc. France, 1, 70, 1851). The third name is *Taxodium Washingtonianum* Winslow (Calif. Farmer, September, 1851). The fourth name is *Sequoia Wellingtonia* Seeman (Bonplandia, 111, 27, 1855).

The *Bigtree* is now conceded to rightly belong to the genus *Sequoia* of Endlicher (Syn. Conif., 147, 1817), and the specific term *gigantea* being the first applied, the apparently correct name would be *Sequoia gigantea*, the name applied by Decaisne (l. c., 1851). But this name being identical with one previously applied by Endlicher in 1817 to the California Redwood, must, by reason of being antedated, fall into synonymy and the next oldest name be sought for the *Bigtree*.

Passing over Winslow's *Taxodium Washingtonianum* (l. c., 1851) on the ground that it is thought not to be properly published, some botanists would now apply Seeman's *Sequoia Wellingtonia* (l. c., 1855). It is here maintained, however, that the rightful name should be *Sequoia washingtoniana* (Winslow) Sudw., and for the following reasons:

It has been asserted that *Taxodium Washingtonianum* Winslow (l. c., 1851) is technically unpublished, and therefore to be disregarded. The writer believes this name

## VARIETIES DISTINGUISHED IN CULTIVATION.

*Sequoia sempervirens gracilis* Carr.  
*Sequoia sempervirens taxifolia* Carr.  
*Sequoia sempervirens adpressa* Carr.  
*Sequoia sempervirens picta* Sudw.  
*Sequoia sempervirens albo-spica* (Gord.) Beissn.  
*Sequoia sempervirens glauca* Gord.

## LIBOCEDRUS Endl.

**Libocedrus decurrens Torr.****Incense Cedar.**

RANGE.—From Oregon (North Fork of Santiam River and southward on the western slopes of the Cascade Mountains); through California (western slopes of Sierra Nevada Mountains and coast ranges from southern border of Mendocino County to San Bernardino, San Jacinto, and Cuayama mountains); western Nevada; Lower California (Mount San Pedro Martin).

NAMES IN USE.—White Cedar (Cal., Oreg.); Cedar (Cal., Oreg.); Incense Cedar (Cal., Oreg.); Post Cedar (Cal., Nev.); Juniper (Nev.); Bastard Cedar (Cal., Wash.); Red Cedar; California Post Cedar (Cal. lit.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

*Libocedrus decurrens depressa* Gord.  
*Libocedrus decurrens columnaris* Beissn.  
*Libocedrus decurrens compacta* Beissn.  
*Libocedrus decurrens glauca* Beissn.

was tenably published, a conviction which is supported by the following quotation from Winslow's published letter (l. c., 1854):

"The name that has been applied to this tree by Professor Lindley, an English botanist, is *Wellingtonia gigantea*." \* \* \*

"If the tree be a *Taxodium*, let it be called *Taxodium Washingtonianum*. If a new genus, *Washingtonia Californica*."

According to Article VI of the Rochester Code of laws adopted for botanical nomenclature, Winslow's *Taxodium Washingtonianum* is validly published by reason of his having fulfilled the essential conditions of the following clause of Article VI: "Publication of a species consists \* \* \* (2) in the publishing of a binomial with reference to a previously published species as a type."

This is a common and expedient method employed by botanists in publishing new names for plants found to have been previously characterized under synonyms, which results in duplicate names in the same genus, and therefore often leaves a plant without a tenable name. The method of referring to the "previously published species as a type" is usually to print such species' name and author in connection with the newly proposed name, and in such a way that the two designations are seen to be presented as equivalents, the one to replace the other.

Now, since *Wellingtonia gigantea* Lindley is a recognized "previously published species," it would seem undeniable that Winslow's intention was to supplant Lindley's name by *Taxodium Washingtonianum*—entirely, of course, because his American patriotism preferred that an American monster tree should bear the name of an American rather than that of an English general. It is maintained here that Winslow definitely pointed out the tree he had in mind by stating that Lindley had called it *Wellingtonia gigantea* (an undisputably published name), and that he effected the publication of *Taxodium Washingtonianum* for this tree by proposing this name as a substitute for Lindley's name.

In interpreting the fundamental object of the article cited for the publication of species and applying it to all cases likely to arise, it would seem the duty of the interpreter to abide by the principle involved in the law, and to be influenced rather by the actual meaning of a describer's combined words than by his unfortunate lack of technical procedure in description.

**THUJA** Linn.**Thuja occidentalis** Linn.**Arborvitæ.**

RANGE.—From New Brunswick to Lake Winnipeg and south to central Minnesota and Michigan, northern Illinois, and in the Atlantic region along the mountains to North Carolina and eastern Tennessee (Holston River).

NAMES IN USE.—Arborvitæ (Me., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., Ind., Ill., Wis., Mich., Minn., Ohio, Ont.); White Cedar (Me., N. H., Vt., R. I., Mass., N. Y., N. J., Va., N. C., Wis., Mich., Minn., Ont.); Cedar (Me., Vt., N. Y.); American Arborvitæ (N. Y. and in cult. Eng.); Oo-soo-ha-tah=Feather-leaf (Indians); Vitæ (Del.); Atlantic Red Cedar (Cal. lit.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

- Thuja occidentalis ellwangeriana* (Gord.) Beissn.
- Thuja occidentalis spaethi* Beissn.
- Thuja occidentalis wareana* Gord.
- Thuja occidentalis wareana lutescens* Beissn.
- Thuja occidentalis wareana globosa* Beissn.
- Thuja occidentalis densa* Gord.
- Thuja occidentalis walthamensis* Gord.
- Thuja occidentalis fastigiata* Beissn.
- Thuja occidentalis fastigiata nova* Beissn.
- Thuja occidentalis l'haveana* Beissn.
- Thuja occidentalis rosenthali* Beissn.
- Thuja occidentalis viridis* Beissn.
- Thuja occidentalis theodonensis* Beissn.
- Thuja occidentalis tatarica* Beissn.
- Thuja occidentalis riversi* Beissn.
- Thuja occidentalis vervæneana* Gord.
- Thuja occidentalis lutea* Veitch.
- Thuja occidentalis lutea humilis* Sudw.
- Thuja occidentalis aurea* Gord.
- Thuja occidentalis varia* Sudw.
- Thuja occidentalis pendula* Gord.
- Thuja occidentalis pendula glaucescens* Sudw.
- Thuja occidentalis reflexa* Carr.
- Thuja occidentalis bodmeri* Beissn.
- Thuja occidentalis athrotaxoides* Beissn.
- Thuja occidentalis recurvata* Beissn.
- Thuja occidentalis recurvata argenteo-variegata* Beissn.
- Thuja occidentalis recurva pusilla* Sudw.
- Thuja occidentalis denudata* Beissn.
- Thuja occidentalis asplenifolia* Carr.
- Thuja occidentalis gracilis* Gord.
- Thuja occidentalis filicoides* Beissn.
- Thuja occidentalis cristata* Gord.
- Thuja occidentalis boothi* Beissn.
- Thuja occidentalis globosa* Gord.
- Thuja occidentalis globularis* Beissn.
- Thuja occidentalis hoveyi* Gord.
- Thuja occidentalis spihlmanni* Beissn.
- Thuja occidentalis frœbeli* Beissn.
- Thuja occidentalis parva* Sudw.

*Thuja occidentalis albo-variegata* Beissn.  
*Thuja occidentalis aureo-variegata* Beissn.  
*Thuja occidentalis argentea* Gord.  
*Thuja occidentalis alba* Gord.  
*Thuja occidentalis little-gem* Beissn.  
*Thuja occidentalis silver-queen* Beissn.

***Thuja plicata* Don.**

**Giant Arborvitæ.**

*THUYA GIGANTEA* Nutt.

RANGE.—From coast of southern Alaska to northern California (Mendocino County); eastward through British Columbia and northern Washington to northern Idaho (Cœur d'Alene, Bitter Root, and Salmon River mountains) and Montana; western slopes Rocky Mountains.

NAMES IN USE.—Red Cedar (Idaho, Oreg., Wash.); Canoe Cedar (Oreg., Wash.); Arborvitæ (Cal.); Shinglewood (Idaho); Gigantic Cedar (Cal.); Cedar (Oreg.); Gigantic Red Cedar (Cal. lit.); Western Cedar; Gigantic or Pacific Red Cedar (Cal. lit.); Lobb's Arborvitæ (in cult. Eng.); Pacific Red Cedar (Cal. lit.).

VARIETIES DISTINGUISHED IN CULTIVATION.

*Thuja plicata gracillima* (Beissn.) Sudw.  
*Thuja plicata atrovirens* (Gord.) Sudw.  
*Thuja plicata aurescens* (Beissn.) Sudw.  
*Thuja plicata argenteo-versicolor* Sudw.  
*Thuja plicata flava* Sudw.  
*Thuja plicata variegata* Carr.  
*Thuja plicata compacta* (Carr.) Beissn.  
*Thuja plicata llaveana* Gord.  
*Thuja plicata minima* Gord.  
*Thuja plicata erecta* (Gord.) Sudw.  
*Thuja plicata pumila* (Gord.) Sudw.  
*Thuja plicata penduliformis* Sudw.  
*Thuja plicata cristatiformis* Sudw.

***CUPRESSUS* Linn.**

***Cupressus macrocarpa* Hartw.**

**Monterey Cypress.**

RANGE.—Southern California coast (from Cypress Point to south shores of Carmel Bay and on Point Lobos).

NAME IN USE.—Monterey Cypress (Cal.)

VARIETIES DISTINGUISHED IN CULTIVATION.

*Cupressus macrocarpa angulata* Lemm.  
*Cupressus macrocarpa lambertiana* (Carr.) Mast.  
*Cupressus macrocarpa crispisii* Mast.

***Cupressus goveniana* Gord.**

**Gowen Cypress.**

RANGE.—California coast region (Mendocino County to San Diego County).

NAME IN USE.—North Coast Cypress (Cal. lit.).

VARIETIES DISTINGUISHED IN CULTIVATION.

*Cupressus goveniana parva* Sudw.  
*Cupressus goveniana huberiana* Carr.  
*Cupressus goveniana glaucifolia* Sudw.

*Cupressus goveniana gracilis* (Nels.) Carr.  
*Cupressus goveniana cornuta* Carr.  
*Cupressus goveniana viridis* Carr.  
*Cupressus goveniana attenuata* (Gord.) Carr.

***Cupressus macnabiana* Murr.**

**Macnab Cypress.**

RANGE.—California (south and west of Clear Lake, Lake County; very rare; once reported from the southern base of Mount Shasta, but at present not known to exist there).

NAMES IN USE.—Cypress; White Cedar; Shasta Cypress (Cal.); MacNab's Cypress (cult. Eng., Eu.); California Mountain Cypress (Cal. lit.).

***Cupressus arizonica* Greene.**

**Arizona Cypress.**

*CUPRESSUS GUADALUPENSIS* Sarg., not Wats.

RANGE.—Arizona (central, eastern, and southern mountains; Santa Rita, Santa Catalina, and Chihuahua mountains); Mexico (mountains of Sonora and Chihuahua).

NAMES IN USE.—Yew (Ariz.); Arizona Cypress (Ariz.); Red bark Cypress (Ariz.); Arizona Red-bark Cypress.

**CHAMÆCYPARIS Spach.**

***Chamæcyparis thyoides* (L.) B. S. P.**

**White Cedar.**

*CHAMÆCYPARIS SPILEROIDEA* Spach.

RANGE.—Coast region from southern Maine to northern Florida and westward to Mississippi (Pearl River).

NAMES IN USE.—White Cedar (Mass., R. I., N. Y., N. J., Pa., Del., N. C., S. C., Fla., Ala., Miss.); Swamp Cedar (Del.); Post Cedar (Del.); Juniper (Ala., N. C., Va.).

VARIETIES DISTINGUISHED IN CULTIVATION.

*Chamæcyparis thyoides glauca* (Endl.) Sudw.  
*Chamæcyparis thyoides crocea* Sudw.  
*Chamæcyparis thyoides variegata* (Lond.) Sudw.  
*Chamæcyparis thyoides atrovirens* (Knight) Sudw.  
*Chamæcyparis thyoides pyramidata* (Beissn.) Sudw.  
*Chamæcyparis thyoides fastigiata cinereo folia* Sudw.  
*Chamæcyparis thyoides penduliformis* Sudw.  
*Chamæcyparis thyoides hoveyi* (Veitch) Sudw.  
*Chamæcyparis thyoides nana* (Lond.) Sudw.  
*Chamæcyparis thyoides leptoclada* (Gord.) Sudw.  
*Chamæcyparis thyoides pumila* (Carr.) Sudw.  
*Chamæcyparis thyoides ericoides* (Knight) Sudw.

***Chamæcyparis nootkatensis* (Lamb.) Spach.**

**Yellow Cedar.**

*CHAMÆCYPARIS NUTKAËNSIS* Spach.

RANGE.—Coast region and islands from Sitka through Washington and Oregon (in Cascade Mountains as far as the Santiam River and Mount Jefferson); east in Washington to the head waters of Yakima River.

NAMES IN USE.—Yellow Cedar (Oreg.); Sitka Cypress (Oreg., Cal.); Yellow Cypress (Oreg., Wash.); Nootka Cypress (Cal. lit.); Nootka Sound Cypress (cult. Eng.); Alaska Ground Cypress (Cal. lit.); Alaska Cypress (Cal. lit.).



## VARIETIES DISTINGUISHED IN CULTIVATION.

*Chamæcyparis nootkatensis viridifolia* Sudw.  
*Chamæcyparis nootkatensis cinerascens* Sudw.  
*Chamæcyparis nootkatensis cinerascens genuina* Sudw.  
*Chamæcyparis nootkatensis cinerascens aureo-discolor* Sudw.  
*Chamæcyparis nootkatensis argenteo-varians* Sudw.  
*Chamæcyparis nootkatensis aureo-versicolor* Sudw.  
*Chamæcyparis nootkatensis zanthophylla* Sudw.  
*Chamæcyparis nootkatensis pendens* Sudw.  
*Chamæcyparis nootkatensis compacta* (Veitch) Beissn.  
*Chamæcyparis nootkatensis compressa* Beissn.  
*Chamæcyparis nootkatensis nidiformis* Beissn.  
*Chamæcyparis nootkatensis albo-picta* Sudw.  
*Chamæcyparis nootkatensis aureo-viridis* (Hort. Kew.) Sudw.  
*Chamæcyparis nootkatensis picta* Sudw.

46. *Chamæcyparis lawsoniana* (Murr.) Parl. Port Orford Cedar.

RANGE.—Coast region from southwestern Oregon (Coos Bay) to California (Klamath River), extending inland about 40 miles.

NAMES IN USE.—Port Orford Cedar (Oreg., Cal.); Oregon Cedar (Oreg., Cal.); White Cedar (Oreg., Cal.); Ginger Pine (Cal.); Lawson's Cypress (Cal., Oreg.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

*Chamæcyparis lawsoniana erecta* (Gord.) Sudw.  
*Chamæcyparis lawsoniana erecta viridis* (Veitch) Beissn.  
*Chamæcyparis lawsoniana erecta glaucifolia* Sudw.  
*Chamæcyparis lawsoniana erecta glaucescens* Sudw.  
*Chamæcyparis lawsoniana pyramidalis leucophylla* Sudw.  
*Chamæcyparis lawsoniana pyramidalis flaveola* Sudw.  
*Chamæcyparis lawsoniana pyramidalis luteo-tenuis* Sudw.  
*Chamæcyparis lawsoniana rosenthalii* Beissn.  
*Chamæcyparis lawsoniana worlei* Beissn.  
*Chamæcyparis lawsoniana alumni* Beissn.  
*Chamæcyparis lawsoniana monumentalis nova* Beissn.  
*Chamæcyparis lawsoniana monumentalis albescens* Sudw.  
*Chamæcyparis lawsoniana fraseri* Beissn.  
*Chamæcyparis lawsoniana robusta* Beissn.  
*Chamæcyparis lawsoniana robusta aurifolia* Sudw.  
*Chamæcyparis lawsoniana robusta cinerea* Sudw.  
*Chamæcyparis lawsoniana robusta argentifolia* Sudw.  
*Chamæcyparis lawsoniana atroviridis* Sudw.  
*Chamæcyparis lawsoniana cyanea* Sudw.  
*Chamæcyparis lawsoniana cyanea pendens* Sudw.  
*Chamæcyparis lawsoniana beissneriana* Smith and Cie.  
*Chamæcyparis lawsoniana nivea* Beissn.  
*Chamæcyparis lawsoniana lutea* (Gord.) Beissn.  
*Chamæcyparis lawsoniana lutea flavescens* (Gord.) Sudw.  
*Chamæcyparis lawsoniana aurea* (Gord.) Beissn.  
*Chamæcyparis lawsoniana aurea magnifica* (Beissn.) Sudw.  
*Chamæcyparis lawsoniana westermanni* Beissn.  
*Chamæcyparis lawsoniana versicolor* Beissn.  
*Chamæcyparis lawsoniana argenteo-variegata* (Veitch) Beissn.  
*Chamæcyparis lawsoniana argenteo-variegata novicia* Sudw.  
*Chamæcyparis lawsoniana aureo-variegata* (Veitch) Beissn.

*Chamaecyparis lawsoniana aureo-spica* Beissn.  
*Chamaecyparis lawsoniana albo-spica* (Gord.) Beissn.  
*Chamaecyparis lawsoniana overeynderi* Beissn.  
*Chamaecyparis lawsoniana nutans* Sudw.  
*Chamaecyparis lawsoniana nutans vera* (Beissn.) Sudw.  
*Chamaecyparis lawsoniana nutans alba* (Gord.) Sudw.  
*Chamaecyparis lawsoniana filiformis* (Veitch.) Beissn.  
*Chamaecyparis lawsoniana filiformis globosa* Beissn.  
*Chamaecyparis lawsoniana intertexta* (Veitch.) Beissn.  
*Chamaecyparis lawsoniana gracilis* (Gord.) Beissn.  
*Chamaecyparis lawsoniana gracilis pusilla* Sudw.  
*Chamaecyparis lawsoniana laxa* Beissn.  
*Chamaecyparis lawsoniana crispa* Beissn.  
*Chamaecyparis lawsoniana casuarinifolia* Beissn.  
*Chamaecyparis lawsoniana tortuosa* Beissn.  
*Chamaecyparis lawsoniana compacta recens* Sudw.  
*Chamaecyparis lawsoniana fragrans* (Gord.) Beissn.  
*Chamaecyparis lawsoniana fragrans argyropsis* Sudw.  
*Chamaecyparis lawsoniana fragrans conica* Beissn.  
*Chamaecyparis lawsoniana parva* Sudw.  
*Chamaecyparis lawsoniana parva candida* Sudw.  
*Chamaecyparis lawsoniana parva albo-variegata* (Gord.) Sudw.  
*Chamaecyparis lawsoniana parva albo-spiciiformis* Sudw.  
*Chamaecyparis lawsoniana parva densa* Sudw.  
*Chamaecyparis lawsoniana shawi* Beissn.  
*Chamaecyparis lawsoniana minima* (Gord.) Sudw.  
*Chamaecyparis lawsoniana argentea* (Gord.) Beissn.  
*Chamaecyparis lawsoniana argentea depauperata* Sudw.  
*Chamaecyparis lawsoniana argentea minuta* Sudw.  
*Chamaecyparis lawsoniana argentea prostrata* (Beissn.) Sudw.  
*Chamaecyparis lawsoniana forstekiana* Beissn.  
*Chamaecyparis lawsoniana weisseana* Moell.  
*Chamaecyparis lawsoniana silver-queen* Beissn.  
*Chamaecyparis lawsoniana amabilis* (Hort. Kew.) Sudw.  
*Chamaecyparis lawsoniana bowleri* (Hort. Kew.) Sudw.  
*Chamaecyparis lawsoniana californica* (Hort. Kew.) Sudw.  
*Chamaecyparis lawsoniana darleyensis* (Hort. Kew.) Sudw.

## JUNIPERUS Linn.

*Juniperus virginiana* Linn.

Red Juniper.

RANGE.—Nova Scotia and New Brunswick to Florida and west in Ontario (Georgian Bay) to Dakota, central Nebraska and Kansas, and Indian Territory. Actual range imperfectly known at present, the supposed Rocky Mountain and Western range being represented by a new, distinct species (*J. scopularum* Sarg.).

NAMES IN USE.—Red Cedar (N. H., Vt., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Ky., Mo., Ill., Ind., Wis., Iowa, Mich., Minn., Ohio, Ont.); Cedar (Conn., Pa., N. J., S. C., Ky., Ill., Iowa, Ohio); Savin (Mass., R. I., N. Y., Pa., Minn.); Juniper (N. Y., Pa.); Juniper Bush (Minn.); Cedre (La.).

### VARIETIES DISTINGUISHED IN CULTIVATION.

*Juniperus virginiana caroliniana* (Marsh.) Willd.  
*Juniperus virginiana gracilis* (Endl.) Sarg.  
*Juniperus virginiana pyramidiformis* Sudw.  
*Juniperus virginiana pyramidiformis glaucifolia* Sudw.

*Juniperus virginiana pyramidiformis viridifolia* Sudw.  
*Juniperus virginiana camarti* (Koch.) Beissn.  
*Juniperus virginiana polymorpha* Beissn.  
*Juniperus virginiana pendula* Carr.  
*Juniperus virginiana smithi penduliformis* Sudw.  
*Juniperus virginiana chamberlayni* Carr.  
*Juniperus virginiana nutans* Beissn.  
*Juniperus virginiana interrupta* (Wend.) Beissn.  
*Juniperus virginiana dumosa* Carr.  
*Juniperus virginiana pumila* Gord.  
*Juniperus virginiana pumila nivea* (Beissn.) Sudw.  
*Juniperus virginiana schotti* Gord.  
*Juniperus virginiana tripartita* Gord.  
*Juniperus virginiana tripartita aureo-versicolor* Sudw.  
*Juniperus virginiana kosteriana* Beissn.  
*Juniperus virginiana glaucescens* Sudw.  
*Juniperus virginiana cinerascens* Carr.  
*Juniperus virginiana plumosa alba* (Carr.) Beissn.  
*Juniperus virginiana plumosa candida* Sudw.  
*Juniperus virginiana albo-spica* Beissn.  
*Juniperus virginiana albo-variegata* Beissn.  
*Juniperus virginiana aureo-spica* Beissn.  
*Juniperus virginiana aureo-variegata* Veitch.  
*Juniperus virginiana aurea superba* Sudw.  
*Juniperus virginiana elegantissima* Beissn.  
*Juniperus virginiana horizontaliformis* Sudw.  
*Juniperus virginiana triomphe d'angers* Beissn.

### ***Juniperus barbadensis* Linn.**

### **Southern Red Juniper**

*JUNIPERUS VIRGINIANA* authors in part, not L.

RANGE.—South Atlantic and Gulf Coast region and southward through Florida. Range imperfectly known at present. Formerly not distinguished from the more northern true *J. virginiana*.

### ***Juniperus occidentalis* Hook.**

### **Western Juniper.**

RANGE.—From western Idaho, eastern Oregon, on Cascade, Sierra Nevada Mountains to southern California (San Bernardino Mountains).

NAMES IN USE.—Juniper (Oreg., Cal., Colo., Utah, Nev., Mont., Idaho, N. Mex.); Cedar (Idaho, Mont.); Yellow Cedar (Colo., Mont.); Western Cedar (Idaho); Western Red Cedar; Western Juniper (Cal. lit.)

### ***Juniperus scopulorum* Sargent.**

### **Rocky Mountain Juniper.**

*JUNIPERUS VIRGINIANA* authors in part, not L.

RANGE.—Nebraska and Dakota (Black Hills) to Montana, Idaho, northern Washington and British Columbia to Vancouver Island; Rocky Mountains from Montana to Arizona and Nevada. Range imperfectly known.

### ***Juniperus monosperma*<sup>1</sup> (Engelm.) Sarg.**

### **One-seed Juniper.**

RANGE.—Eastern base Rocky Mountains of Colorado (Platte and Arkansas rivers) and southward into western Texas; southern Utah to central New Mexico and Arizona.

NAMES IN USE.—One-seeded Juniper; Naked-seeded Juniper (Cal. lit.)

<sup>1</sup>*Juniperus Knighti* Nelson, in Bot. Gaz., XXV, 198, f. 1, 2, 1898. Prof. Aven Nelson describes this species as a "scraggy shrub or small tree" common in the Red Desert region of Wyoming from the Seminole Mountains to the Green River. I have not examined specimens, but its affinities appear to be with *J. monosperma* and *J. scopulorum*.

**Juniperus sabinoides** (H. B. K.) Sargent. **Mountain Juniper.**

RANGE.—Central Texas (Colorado River), southward and westward.

NAMES IN USE.—Juniper Cedar (Tex.); Mountain Cedar (Tex.); Juniper; Mountain Juniper; Rock Cedar (Tex.).

**Juniperus californica** Carr. **California Juniper.**

RANGE.—Central California (lower Sacramento River) and southward through California in coast ranges and in Sierra Nevada to Kernville and Lower California.

NAMES IN USE.—White Cedar; Juniper (Cal.); California Juniper (Cal. lit.); Sweet-fruited Juniper (Cal.); Sweet-berried Cedar.

**Juniperus utahensis** (Engelm.) Lemm. **Utah Juniper.**

RANGE.—Desert region from eastern Utah (Wasatch Mountains) to southeastern California, northern Arizona, and western Colorado.

NAMES IN USE.—Juniper (Utah); Western Red Cedar, Desert Juniper (Cal. lit.); Utah Juniper.

**Juniperus pachyphloea** Torr. **Alligator Juniper.**

RANGE.—Southwestern Texas (Eagle and Limpia mountains), and westward on desert ranges of New Mexico and Arizona south of Colorado River plateau; mountains of northern Arizona; Mexico.

NAMES IN USE.—Juniper (Ariz., N. Mex.); Oak-barked Cedar (Ariz.); Alligator Juniper (Ariz.); Oakbark Juniper (Ariz.); Mountain Cedar (Tex.); Thick-barked Juniper (Cal. lit.); Checkered-barked Juniper (lit.).

**Juniperus flaccida** Schl. **Drooping Juniper.**

RANGE.—Southwestern Texas (Chisos Mountains); northeastern Mexico.

**Juniperus communis** Linn. **Dwarf Juniper.**

RANGE.—From Greenland to Alaska and in the east southward to Pennsylvania and northern Nebraska; in the Rocky Mountains to Texas, New Mexico, and Arizona; in the Pacific region to northern California; also in Old World.

#### VARIETIES DISTINGUISHED IN CULTIVATION.

*Juniperus communis cracovia* (Koch) Beissn.

*Juniperus communis suecica* (Mill.) Lond.

*Juniperus communis hibernica* (Lodd.) Gord.

*Juniperus communis hibernica compressa* Carr.

*Juniperus communis oblonga* (Bieb.) Lond.

*Juniperus communis oblongo-pendula* (Lond.) Carr.

*Juniperus communis pendens* Sudw.

*Juniperus communis hemisphærica* (Presl.) Parl.

*Juniperus communis echinoformis* (Knight) Beissn.

*Juniperus communis variegata aurea* Carr.

*Juniperus communis sibirica* (Burgsd.) Rydberg.

*Juniperus communis argyrophylla* Sudw.

*Juniperus communis pygmæa* (Koch) Sudw.

## Family TAXACEÆ.

### TUMION Raf.

**Tumion taxifolium** (Arn.) Greene.

**Florida Torreya.**

**TORREYA TAXIFOLIA** Arn.

RANGE.—Western Florida (east bank of Apalachicola River from River Junction to Bristol, Gadsden County); very local.

NAMES IN USE.—Stinking Cedar (Fla.); Savin (Fla.); Torrey-tree (Fla.); Stinking Savin (Fla.); Fetid Yew (Eng. lit.).

**Tumion californicum** (Torr.) Greene.**California Torreya.****TORREYA CALIFORNICA** Torr.

RANGE.—California (Mendocino County to Santa Cruz Mountains in Santa Clara County).

NAMES IN USE.—California Nutmeg (Cal. : Stinking Cedar; Yew (Idaho); California False Nutmeg (Cal. lit.); Coast Nutmeg (Cal. lit.).

**TAXUS** Linn.**Taxus brevifolia** Nutt.**Pacific Yew.**

RANGE.—Pacific coast region from British Columbia (Queen Charlotte Island and Skeena River), and east to Selkirk Mountains; through western Washington and Oregon to California (coast ranges to Monterey Bay and western slopes of Sierra Nevada Mountains to Tulare County); mountains of eastern Washington and Oregon to Montana (western slopes of Rocky Mountains).

NAMES IN USE.—Yew (Cal., Idaho, Oreg.); Mountain Mahogany (Idaho); Western Yew (Cal.); Pacific Yew (Cal. lit.).

**Taxus floridana** Nutt.**Florida Yew.**

RANGE.—Western Florida (east bank of Apalachicola River, Gadsden County, from Aspalaga to the vicinity of Bristol); very local.

NAMES IN USE.—Yew (Fla.); Savin (Fla.).

**MONOCOTYLEDONES.**Family **PALMACEÆ.****THRINAX** Linn. f.**Thrinax parviflora** Swartz.**Silktop Palmetto.**

RANGE.—Southern Florida keys (from Bahia Honda Key to Longs Key); Bahamas.

NAMES IN USE.—Silktop Palmetto (Fla.); Silver Thatch (Fla.).

**Thrinax microcarpa** Sargent.**Silvertop Palmetto**

RANGE.—Southern Florida (No-Name Key, Boca Chica Key, and Bahia Honda Key); also on Sugar Loaf Sound.

NAMES IN USE.—Silvertop Palmetto (Fla.); Prickley Thatch (Fla.); Brittle Thatch (Fla.).

**SABAL** Adans.**Sabal palmetto** (Walt.) Roem. & Sch.**Cabbage Palmetto.**

RANGE.—Coast region from North Carolina (Smiths Island, Cape Fear River) to Florida (Key Largo), and on the Gulf coast to the Apalachicola River.

NAMES IN USE.—Cabbage Palmetto (N. C., S. C.); Bauk's Palmetto (N. C.); Palmetto (N. C., S. C.); Cabbage-tree (Miss., Fla.); Tree Palmetto (La.).

**Sabal mexicana** Mart.**Mexican Palmetto.**

RANGE.—Southwestern Texas (Rio Grande River from near Edinburg nearly to the Gulf of Mexico) and southward into Mexico (in coast region to southern part).

**PSEUDOPHOENIX** Wendl.**Pseudophoenix Sargentii** Wendl.**Sargent Palm.**

RANGE.—Southern Florida keys (Ellhotts Key and Key Largo); Bahamas.

NAMES IN USE.—Florida Palm (Fla.); Sargent's Palm.

## OREODOXA Willd.

**Oreodoxa regia** H. B. K.**Royal Palm.**

RANGE.—Florida (on Rogues River, 20 miles east of Caximbas Bay, Longs Key, Biscayne Bay, near mouth of Little River); West Indies, and Central America.

NAME IN USE.—Royal Palm (Fla.).

**NEOWASHINGTONIA**<sup>1</sup> Sudworth.**Neowashingtonia filamentosa** (Wendl.) Sudw.**Fanleaf Palm.**

WASHINGTONIA FILIFERA Wendl.

RANGE.—Southern California (San Bernardino Mountains to Colorado River).

NAMES IN USE.—Washington Palm (Cal.); California Fan Palm (Cal.); Arizona Palm (Cal.); Wild Date (Cal.); Fanleaf Palm (Cal.).

## Family LILIACEÆ.

**YUCCA** Linn.**Yucca treculeana** Carr.**Spanish Bayonet.**

RANGE.—Texas (Matagorda Bay) and southward into Mexico (Sierra Madre Mountains, Nuevo Leon), and along the Rio Grande to the eastern base of mountains of western Texas.

NAME IN USE.—Spanish Bayonet (Tex.).

**Yucca arborescens** (Torr.) Trelease.**Joshua-tree.**

YUCCA BREVIFOLIA Engelm.

RANGE.—Southwestern Utah to California (to the western and northern borders of the Mohave Desert).

NAMES IN USE.—Tree Yucca (Cal.); Yucca Cactus (Cal.); The Joshua (Utah); Joshua tree (Utah, Ariz., N. Mex.).

**Yucca brevifolia** Torr.**Schott Yucca.**

RANGE.—Southern boundary of Arizona; Mexico.

**Yucca constricta** Buckl.

RANGE.—Southwestern Texas to southern Arizona; northern Mexico.

**Yucca macrocarpa** (Torr.) Coville.**Broadfruit Yucca.**

RANGE.—Southwestern Texas (desert plateau).

**Yucca mohavensis** Sargent.**Mohave Yucca.**

RANGE.—From northeastern Arizona and southern Nevada into California (across the Mohave Desert); and from southern base of San Bernardino Mountains to the coast and northward to Monterey Bay.

**Yucca aloifolia** Linn.**Aloë-leaf Yucca.**

RANGE.—Coast of North Carolina to Florida and Gulf coast to Louisiana.

NAME IN USE.—Spanish Bayonet.

**Yucca gloriosa** Linn.**Spanish Dagger.**

RANGE.—Coast of South Carolina and islands.

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Yucca gloriosa plicata** Carr.

**Yucca gloriosa recurvifolia** Engelm.

<sup>1</sup> = Washingtonia Wendl. (1879), not of Winslow (1854) nor of Carr. (1867).

# DICOTYLEDONES.

## Family JUGLANDACEÆ.

### JUGLANS Linn.

#### *Juglans cinerea* Linn.

#### Butternut.

RANGE.—Southern New Brunswick to Delaware and on the Appalachian Mountains to Georgia and Alabama (head waters of Black Warrior River, Winston County); westward through Ontario to Dakota, southeastern Nebraska, southern Missouri, and northeastern Arkansas.

NAMES IN USE.—Butternut (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Ala., Ark., Ky., Mo., Ill., Iowa, Ind., Mich., Minn., Wis., Kans., Nebr., Ohio, Ont.); White Walnut (Del., Pa., Va., W. Va., N. C., S. C., Ala., Ky., Mo., Ill., Ind., Wis., Iowa, Nebr., Minn., S. Dak.); Walnut (Minn.); Oil Nut (Me., N. H., S. C.); Buttnut (N. J.).

#### *Juglans nigra* Linn.

#### Black Walnut.

RANGE.—Southern Ontario to Florida, central Alabama and Mississippi, and westward through southern Michigan, Wisconsin, and Minnesota to Nebraska, Kansas, and Texas (San Antonio River).

NAMES IN USE.—Black Walnut (N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Del., Pa., Va., W. Va., N. C., Ga., Fla., Ala., Miss., Tex., La., Ark., Ky., Mo., Ind., Ill., Kans., Nebr., Iowa, Mich., Ohio, Ont., S. Dak., Minn.); Walnut (N. Y., Del., W. Va., Fla., Ky., Mo., Ohio, Ind., Iowa); Walnut-tree (Pa., S. C.); Dent-soo-kwa-no-ne (= Round Nut, N. Y. Indians).

#### *Juglans rupestris* Engelm.

#### Mexican Walnut.

RANGE.—Central Texas (Colorado, Llano, and Guadalupe rivers) westward through southern New Mexico and Arizona and southward into Mexico.

NAMES IN USE.—Western Walnut (Tex.); Dwarf Walnut (Tex.); Little Walnut (Tex.); California Walnut (Ariz.); Walnut (N. Mex., Ariz.).

#### *Juglans californica* Wats.

#### California Walnut.

RANGE.—California coast region (from the Sacramento River to the San Bernardino Mountains).

NAMES IN USE.—Walnut (Cal.); California Walnut (Cal.).

### HICORIA Raf.

#### *Hicoria pecan* (Marsh.) Britton.

#### CARYA OLIVIFORMIS Nutt.

RANGE.—Iowa (vicinity of Sabula) through southern Illinois and Indiana, western Kentucky and Tennessee to central Alabama and Mississippi, through Missouri and Arkansas to southeastern Arkansas, Indian Territory, western Louisiana and central Texas (Concho River); Mexico. Considerably extended by cultivation.

NAMES IN USE.—Pecan (Va., N. C., S. C., Ga., cult.), Ala., Miss., Tex., La., Ark., Mo., Ill., Ind., Iowa, Kans.); Pecan Nut (La.); Pecanier (La.); Pecan-tree (La.).

*will not form root  
sprouts on stumps over 6" ind  
unless on very good soil.*

Pecan (Hickory).

**Hicoria pecan**  $\times$  **minima** Trelease.

**Hicoria pecan**  $\times$  **alba** Trelease.

**Hicoria pecan**  $\times$  **laciniosa** Trelease. **Nussbaum Hybrid (Hickory).**

**Hicoria minima** (Marsh.) Britton.

**Bitternut (Hickory).**

**CARYA AMARA** Nutt.

RANGE.—Southern Maine and Ontario to Florida (Apalachicola River); west through central Michigan to Minnesota, Nebraska, Kansas, Indian Territory, and Texas (Trinity River).

NAMES IN USE.—Bitternut (N. H., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Fla., Ala., Miss., La., Tex., Ark., Mo., Ill., Kans., Nebr., Mich., Minn., Ohio, Ont.); Swamp Hickory (Del., Pa., N. C., S. C., Miss., Tex., Ark., Iowa, Minn.); Pig Hickory (Ill.); Pig Nut (N. Y., W. Va., Mo., Ill., Iowa, Kans.); Bitter Pecan Tree, Pecanier Amer., Pecanier Sauvage (La.); Bitter Pig Nut (N. Y., N. J.); Hickory (Nebr.); Bitter Hickory (N. H.); Pig Walnut (N. H.); Bitter Walnut (Vt.); Noyer Dur (Quebec); White Hickory (Tex.).

**Hicoria myristicæformis** (Michx. f.) Britton.

**Nutmeg Hickory.**

**CARYA MYRISTICÆFORMIS** Nutt.

RANGE.—Coast region of South Carolina (Goose Creek, Cooper River); central Alabama (between Tombigbee and Alabama rivers, from Demopolis to Gallion); central Mississippi (Mhoons Valley); southern Arkansas (Pine Bluff to Arkansas City, and in Red River bottoms above Fulton). Often cultivated in the middle Atlantic region.

NAMES IN USE.—Nutmeg Hickory (S. C., Ala.); Bitter Waternut (La.).

**Hicoria aquatica** (Michx. f.) Britton.

**Water Hickory.**

**CARYA AQUATICA** Nutt.

RANGE.—Coast region Virginia (Mobjack Bay) to Florida (Cape Malabar and Coosa), and in the Gulf region to Texas (Brazos River) extending northward in western Louisiana to northeastern Arkansas, eastern Mississippi and southern Illinois (Gallatin County, near Equality).

NAMES IN USE.—Water Hickory (N. C., Fla., Ala., Miss., La., Tex., Mo.); Swamp Hickory (S. C., Fla., Miss., La.); Bitter Pecan (Miss., La., Tex.); Water Bitternut (S. C., Tenn.).

**Hicoria ovata** (Mill.) Britton.

**Shagbark (Hickory).**

**CARYA ALBA** Nutt.

RANGE.—Southern Maine and Quebec (near Montreal) to Delaware and along the Appalachian Mountains to Florida, northern Alabama and Mississippi; west through southern Michigan to central Minnesota and northeastern Nebraska, central Kansas, Indian Territory, and eastern Texas.

NAMES IN USE.—Shellbark Hickory (Vt., N. H., Mass., R. I., N. Y., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Miss., La., Tex., Ark., Ky., Mo., Ind., Ill., Wis., Iowa, Kans., Nebr., Ohio, Ont., Mich.); Shagbark Hickory (Vt., N. H., Mass., R. I., Conn., N. Y., N. J., Pa., Del., S. C., Ala., Miss., Tex., Ark., Mo., Ill., Wis., Mich., Minn., Kans., Nebr., Iowa); Shellbark (R. I., N. Y., Pa., N. C.); Upland Hickory (Ill.); Hickory (Vt., Ohio); Sealybark Hickory (W. Va., S. C., Ala.); Shagbark (R. I., Ohio);



Shellbark-tree (Del.); White Walnut (N. J.); Walnut (Vt., N. Y.); White Hickory (Iowa, Ark.); Shagbark Walnut (Vt.); Sweet Walnut (Vt.); Redheart Hickory (Miss.).

**Hicoria laciniosa** (Michx. f.) Sargent.

**Shellbark (Hickory).**

**CARYA SULCATA** Nutt.

RANGE.—Iowa (vicinity of Muscatine) through Missouri, Arkansas, eastern Kansas, and Indian Territory (near Ouachita), southern Illinois and Indiana to middle Tennessee, western and central New York and eastern Pennsylvania.

NAMES IN USE.—Big Shellbark (R. I., Pa., W. Va., Ky., Mo., Ill., Kans.); Bottom Shellbark (Ill.); Western Shellbark, Shellbark (R. I., Ky.), Thick Shellbark (S. C., Tenn., Ind.); Thick Shellbark Hickory (N. C., Ark.); King Nut (Tenn.).

**Hicoria alba** (Linn.) Britton.

**Mocker Nut (Hickory).**

**CARYA TOMENTOSA** Nutt.

RANGE.—Ontario to Florida (Cape Canaveral and Tampa Bay) and west to Missouri, eastern Kansas, Indian Territory and Texas (Brazos River).

NAMES IN USE.—Mocker Nut (Mass., R. I., N. Y., N. J., Del., Ala., Miss., La., Tex., Ark., Ill., Iowa, Kans.); Whiteheart Hickory (R. I., N. Y., Pa., Del., N. C., Tex., Ill., Ont., Iowa, Kans., Minn., Nebr.); Bullnut (N. Y., Fla., Miss., Tex., Mo., Ohio, Ill., Minn.); Black Hickory (Tex., Miss., La., Mo.); Big-bud, Red Hickory (Fla.); Hickory (Ala., Tex.); Hardbark Hickory (Ill.); Hickory (Pa., S. C., Nebr.); Common Hickory (N. C.); White Hickory (Pa., S. C.); Hickory Nut (Ky.); Big Hickory Nut (W. Va.); Hog Nut (Del.).

**Hicoria glabra** (Mill.) Britton.

**Pignut (Hickory).**

**CARYA PORCINA** Nutt.

RANGE.—Southern Maine and southern Ontario to Florida (Indian River and Peace Creek); west through southern Michigan to southeastern Nebraska, eastern Kansas, Indian Territory and eastern Texas (Nueces River).

NAMES IN USE.—Pignut (N. H., Vt., Mass., Conn., R. I., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Fla., Ala., Miss., La., Tex., Ark., Ky., Mo., Ill., Ind., Wis., Iowa, Kans., Nebr., Minn., Ohio, Ont.); Bitternut (Ark., Ill., Iowa, Wis.); Black Hickory (Miss., La., Ark., Mo., Ind., Iowa); Broom Hickory (Mo.); Brown Hickory (Del., Miss., Tex., Tenn., Minn.); Hard-shell (W. V.); Red Hickory (Del.); Switch-bud Hickory (Ala.); White Hickory (N. H., Iowa).

**Hicoria odorata** (Marsh.) Sargent.

**Small Pignut (Hickory).**

**CARYA MICROCARPA** Nutt.

RANGE.—Eastern Massachusetts, Connecticut, eastern and central New York, eastern Pennsylvania, Delaware, District of Columbia, Maryland (Montgomery County), central Michigan, southern Illinois, Indiana, and Missouri.

NAMES IN USE.—Small Pignut (Md.); Little Pignut (Md.); Little Shagbark (Md.).

**Hicoria villosa** (Sarg.) Ashe.

**Pale-leaf Hickory.**

**HICORIA GLABRA VILLOSA** Sarg.

**HICORIA PALLIDA** Ashe.

RANGE.—Missouri (Allentown); middle Tennessee and northern Alabama to Georgia and southern Virginia. Distribution insufficiently known.

## Family MYRICACEÆ.

## MYRICA Linn.

**Myrica cerifera** Linn.**Wax Myrtle.**

RANGE.—Southern Maryland to southern Florida and west in the Gulf States to Texas (Rockport, Arkansas Bay); northward west of Mississippi River to Arkansas (Washita River). In the Bahamas, Bermuda, West Indies.

NAMES IN USE.—Wax Myrtle (R. I., N. J., Del., N. C., S. C., Ala., Fla.); Bayberry (Mass., R. I., N. J., N. Y., Pa., Del., N. C., S. C., Ala., Fla.); Waxberry (R. I., Pa., S. C.); Crier (La.); Candleberry (Fla.); Myrtle (Fla.); Myrtletree (Fla.); Puckerbush (Fla.).

**Myrica inodora** Bartr.**Odorless Myrtle.**

RANGE.—Near Apalachicola, Fla.; Mobile and Stockton, Ala., and Poplarville, Miss. Rare.

**Myrica californica** Cham.**California Wax Myrtle.**

RANGE.—Pacific coast region from Puget Sound to California (Santa Monica).

NAMES IN USE.—California Bayberry; Myrtle; Bayberry (Cal.); California Myrtle (Cal.); Wax Myrtle (Cal.).

## Family LEITNERIACEÆ.

## LEITNERIA Chapm.

**Leitneria floridana** Chapm.**Corkwood.**

RANGE.—Western Florida (swamp near Apalachicola); Missouri (Butler and Duncan counties); Arkansas (near Varner). Very local, and range imperfectly understood.

*Propagated by cuttings.*

## Family SALICACEÆ.

*Sprouts from pollards, used for fuel, etc.*

**Salix nigra** Marsh.**SALIX** Linn.**Black Willow.**

RANGE.—New Brunswick to southern Florida and west to eastern Dakota, Nebraska, Kansas, Indian Territory, southern Arizona, and south into Mexico. In California (from the Sierra Nevadas to Colusa County, and from Sacramento River to Arizona).

NAMES IN USE.—Black Willow (N. H., Vt., R. I., N. Y., Pa., Del., S. C., Fla., Ala., Miss., La., Tex., Ariz., Cal., N. Mex., Utah, Ill., Wis., Mich., Minn., Nebr., Kan., Ohio, Ont., N. Dak.); Swamp Willow (N. C., S. C.); Willow (N. Y., Pa., N. C., S. C., Miss., Tex., Cal., Ky., Mo., Nebr.).

**Salix nigra falcata** (Pursh) Torr.**Crescentleaf Willow****Salix nigra × amygdaloides** Glott.**Salix nigra × alba** Bebb.**Salix wardi** Bebb.**Ward Willow.**

RANGE.—Virginia (Potomac River near Washington, D. C.), Kentucky (Ohio River), central Tennessee, Illinois (Horse Shoe Lake, near Venice), southern Missouri, Indian Territory. Distribution insufficiently known.

**Salix occidentalis longipes** (Anderss.) Bebb.      **Longstalk Willow.**

RANGE.—Florida (Jacksonville) and westward through Texas to New Mexico, Arizona, and the southern Sierra Nevadas, California. Also in northern Mexico.

**Salix amygdaloides** Anderss.**Almondleaf Willow.**

RANGE.—Quebec (near Montreal) and New York (Cayuga County) to the upper Saskatchewan; southward to Ohio and Missouri, and westward in the Plains region to the Rocky Mountains, where it ranges from southwestern Texas to Oregon, Washington, British Columbia.

NAMES IN USE.—Willow (Nev., Oreg., Colo., Utah, Mont.); Black Willow (Mo., Idaho); Common Willow (Mont.).

**Salix laevigata** Bebb.**Smoothleaf Willow.**

RANGE.—California (Siskiyou County to the southern boundary of the State).

NAMES IN USE.—Willow (Cal.); Black Willow.

**Salix laevigata angustifolia** Bebb.**Narrowleaf Willow.****Salix laevigata congesta** Bebb.**Salix lasiandra** Benth.**Western Black Willow.**

RANGE.—California (west of the Sierra Nevada); western Oregon, Washington, and southern British Columbia (Selkirk Mountains).

NAMES IN USE.—Willow (Cal., Oreg.); Black Willow.

**Salix lasiandra lyalli** Sargent.**Lyall Willow.**

RANGE.—Western Oregon, Washington, and southern British Columbia.

**Salix lasiandra caudata** (Nutt.) Sudworth.

RANGE.—Northern California (Sierra Nevada) to northern Montana, Colorado, and northern New Mexico.

**Salix bonplandiana** H. B. K.**Bonpland Willow.**

RANGE.—Arizona (Sabino Canyon and Santa Catalina mountains); central and southern Mexico.

**Salix lucida** Muehl.**Glossyleaf Willow.**

RANGE.—Newfoundland (Exploits River) to Hudson Bay and northwestward to Great Bear Lake, Mackenzie River, and to the Rocky Mountains; southward to Pennsylvania and west to eastern Nebraska.

**Salix fluviatilis** Nutt.**Longleaf Willow.****SALIX LONGIFOLIA** Muehl.

RANGE.—Quebec (Lake St. John and Island of Orleans) and southward through western New England to the Potomac River; northwestward to the Arctic Circle (valley of Mackenzie River) and British Columbia and California; southward in the Mississippi River basin to northern Mexico and Lower California.

NAMES IN USE.—Sandbar Willow (R. I., Miss., Cal., Kans., Nebr., Minn., S. Dak., Wis., Ont.); Longleaf Willow (Ala., Kans., Mich.); Long-leaved Willow (Tenn., Minn., Nebr., Colo., Cal., Idaho, Wash.); Narrow-leaved Willow (Nebr.); Shrub Willow (Nebr.); White Willow (Mo.); Red Willow (Mont.); Osier Willow (Mont.); Willow (Cal., N. Y., Ky., Ind., Miss., Tex., Cal., Nev., Utah, Mont.).

**Salix fluviatilis exigua** (Nutt.) Sargent.

RANGE.—Western Texas to northern California.

**Salix fluviatilis argrophylla** (Nutt.) Sargent.

RANGE.—Western Texas to northern California.

**Salix sessilifolia** Nutt.**Silverleaf Willow.**

RANGE.—From Puget Sound to southwestern California, ranging through western Washington and Oregon, western slopes of California, Sierra and coast ranges.

NAMES IN USE.—Willow (Cal., Oreg.); Silver Willow (Cal.).

**Salix taxifolia** H. B. K.**Yewleaf Willow.**

RANGE.—Texas (near El Paso), southern Arizona (near Tucson and on mountain streams); Mexico to Guatemala and Lower California.

**Salix bebbiana** Sargent.**Bebb Willow.****SALIX ROSTRATA** Rich.

RANGE.—St. Lawrence River (lower valley) to Hudson Bay and northwestward to the Arctic Circle (Mackenzie River) and British Columbia (coast ranges); south to Pennsylvania and west to Minnesota; western Idaho and northern Montana to Dakota (Black Hills); western Nebraska, through Colorado to northern Arizona.

**Salix discolor** Muhl.**Glaucous Willow.**

RANGE.—Nova Scotia to Manitoba and south to Delaware; southern Indiana and Illinois and northeastern Missouri.

NAMES IN USE.—Glaucous Willow (R. I., N. Y., Pa., Miss., Mich., Minn., Ont.); Pussy Willow (N. J., Minn.); Silver Willow; Swamp Willow (N. J.); Willow (Vt., N. Y., Mo.).

**Salix discolor eriocephala** (Michx.) Anderss.**Salix discolor prinoides** (Pursh) Anderss.**Salix cordata mackenzieana** Hook.**Mackenzie Willow.**

RANGE.—Great Slave Lake and southward (through region along eastern base of Rocky Mountains) to northern Idaho and California (Lake County).

**Salix cordata lutea** (Nutt.) Bebb.**Yellow Willow.**

RANGE.—Southern Assiniboia and northern Montana.

**Salix missouriensis** Bebb.**Missouri Willow****SALIX CORDATA** var. **VESTITA** Sargent, not Pursh.

RANGE.—Western Missouri (Courtney, Jackson County, Fort Osage, and near Watson, Atchison County).

**Salix lasiolepis** Benth.**Bigelow Willow.**

RANGE.—Northern California (Klamath River) and southward through the western part of the State to Lower California and southern Arizona (Tanners Canyon on Huachuca Mountains, and White River Canyon on Chiricahua Mountains).

NAME IN USE.—Willow (Cal., Nev.).

**Salix nuttallii** Sargent.**Nuttall Willow.****SALIX FLAVESCENS** Nutt.

RANGE.—From southern Assiniboia and British Columbia (Columbia River near Donald) southward in the Rocky Mountain region to northern New Mexico and Arizona (San Francisco Mountain); California (Sierra Nevada to the San Bernardino Mountains).

NAMES IN USE.—Mountain Willow (Mont.); Willow (Oreg., Utah); Black Willow.

**Salix nuttallii brachystachys** (Benth.) Sargent.

RANGE.—Western Washington and Oregon, and California coast region.

**Salix piperi** Bebb.**Piper Willow.**

RANGE.—Western Washington.

**Salix hookeriana** Barratt.**Hooker Willow**

RANGE.—Vancouver Island to southern Oregon—coast region.

**Salix alba** Linn.

White Willow.

RANGE.—Europe. Widely naturalized in the United States.

**Salix alba** × **lucida** Bebb.**Salix fragilis** Linn.

Crack Willow.

RANGE.—Europe. Naturalized in eastern North America.

**Salix babylonica** Linn.

Weeping Willow.

RANGE.—Europe. Naturalized in few localities in Atlantic region.

**Salix sitchensis** Sans.

Silky Willow.

RANGE.—Alaska to southern California (Santa Barbara)—coast region.

NAMES IN USE.—Silky Willow (Oreg.); Sitka Willow (Germ. lit.).

**POPULUS** Linn.*Thring up quickly after*

X

**Populus tremuloides** Michx.*like European Tremula*

Aspen.

RANGE.—Southern Labrador to Hudson Bay (southern shores) and northwestward to the Mackenzie River (near mouth) and Alaska (Yukon River); southward to Pennsylvania (mountains), northeastern Missouri, southern Nebraska, and throughout the western mountains to northern New Mexico and Arizona and central California; Lower California (San Pedro Matir Mountains) and Mexico (mountains of Chihuahua).

*transcon-*

NAMES IN USE.—Aspen (N. H., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Ill., Ind., Wis., Mich., Minn., N. Dak., Nebr., Ohio, Ont., Oreg., Utah, Idaho, Nev., Mont., Colo., Cal.); Quaking Asp (N. Y., Pa., Del., Cal., N. Mex., Idaho, Colo., Ariz., Ill., Iowa, Minn., Mont., Nebr., Utah, Oreg., Nev.); Mountain Asp (Mont.); American Aspen (Vt.); Aspen Leaf (Pa.); White Poplar (Mass.); Trembling Poplar (Minn., Colo.); American Poplar (Minn., Colo.); Poplar (Vt., N. Y., Ill., Ind., Minn., Mont.); Popple (Wis., Iowa, Mont.); Tremble (Quebec); Trembling Aspen (Iowa); Aspen Poplar (Cal., Mont.).

*leafy*

VARIETY DISTINGUISHED IN CULTIVATION.

**Populus tremuloides pendens** Sudw.

X

**Populus grandidentata** Michx.

Largetooth Aspen.

RANGE.—Nova Scotia through New Brunswick, southern Quebec, and Ontario to northern Minnesota; southward to Delaware (and along the Allegheny Mountains to North Carolina, central Kentucky, and Tennessee), southern Indiana, and Illinois.

NAMES IN USE.—Large-toothed Aspen (N. J., Pa., Del., S. C., Mich., Minn.); Poplar (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., W. Va., N. C., S. C., Ga., Ill., Ohio); Large-toothed Poplar (N. C.); Large Poplar (Tenn.); White Poplar (Mass.); Popple (Me.); Large American Aspen (Ala.).

VARIETY DISTINGUISHED IN CULTIVATION.

**Populus grandidentata penduliformis** Sudw. Weeping Largetooth Aspen.**Populus heterophylla** Linn.

Swamp Cottonwood.

RANGE.—From Connecticut (North Guilford) and Long Island (Northport) southward near the coast to southern Georgia; westward in the Gulf region to western Louisiana and through Arkansas to southeastern Missouri, western Kentucky, and Tennessee, and southern Illinois and Indiana.

NAMES IN USE.—River Cottonwood (R. I., Miss., La., Ohio); Swamp Cottonwood (S. C., Miss., Del.); Black Cottonwood (Ala.); Cottonwood (N. Y., Va., N. C., S. C., Miss.); Downy Poplar (Tenn., Ala., Ark.); Swamp Poplar (N. J.); Cotton-tree (N. C.); Liar (La.); Langues de femmes (La.).

**Populus balsamifera** Linn. *transcon.* **Balm of Gilead.**

RANGE.—Coast of Alaska and valley of Mackenzie River (latitude 60°) to Hudson Bay and Newfoundland; southward to northern New England and New York (Tanghannock Falls, Cayuga Lake), central Michigan and Minnesota, Dakota (Black Hills), northwestern Nebraska, northern Montana, Idaho, Oregon, and Nevada.

NAMES IN USE.—Balsam (N. H., N. Y., Wis., Mich., Minn., Nebr., Mont., Ohio, Ont.); Balm of Gilead (Me., N. H., Vt., Mass., R. I., Conn., N. Y., Mich., Nebr., Minn., N. Dak., Ont.); Cottonwood (Idaho); Poplar (Wis., Minn.); Balsam Poplar (N. H., Vt., Nebr., Minn.); Tacamahac (Minn.); Baumier (Quebec); Rough-barked Poplar (Hudson Bay region).

**Populus balsamifera candicans** (Ait.) Gray.

**Hairy Balm of Gilead.**

NAMES IN USE.—Balm of Gilead (Me., N. H., Vt., Mass., N. Dak., Minn., Ont.); Balsam (Mich., Md., and Va. Cult.).

#### VARIETIES DISTINGUISHED IN CULTIVATION.

**Populus balsamifera intermedia** Loud.

**Populus balsamifera viminalis** Loud.

**Populus balsamifera latifolia** (Mench.) Loud.

*Rocky Mts.* **Populus acuminata** Rydberg. *narrow leaves*

**Lanceleaf Cottonwood.**

RANGE.—South Dakota (Black Hills) and western Nebraska to the eastern base of the Rocky Mountains of Colorado. Range insufficiently understood.

*very narrow leaves* **Populus angustifolia** James.

**Narrowleaf Cottonwood.**

RANGE.—From southwestern Assiniboia (Milk and Belly rivers) to Dakota (Black Hills) and northwestern Nebraska; southward in the mountain regions to central Nevada, New Mexico (Mogollon Mountains), central Arizona.

NAMES IN USE.—Black Cottonwood (N. Mex., Utah, Colo.); Narrow-leaved Cottonwood (Colo., Utah); Narrow-leaved Poplar (Mont., Utah); Balsam (Mont.); Cottonwood (Idaho, Colo.); Willow Cottonwood (Idaho); Bitter Cottonwood (Idaho); Willow-leaved Cottonwood (Mont.).

**Populus trichocarpa** Torr. & Gr.

**Black Cottonwood.**

RANGE.—From southern Alaska through western British Columbia (east to Columbia River), western Washington, Oregon, California (and islands) to the southern slope of the San Bernardino Mountains. Northern range insufficiently understood.

NAMES IN USE.—Black Cottonwood; Cottonwood (Oreg., Cal.); Balsam Cottonwood; Balm (Oreg.); Balm Cottonwood (Cal.).

*very northern* **Populus deltoides** Marsh.

**(Common) Cottonwood.**

**POPULUS MONILIFERA** Ait. *angulata & Canadensis.*

*lower* RANGE.—From Quebec (Lower Maurice River) and Vermont (Lake Champlain) through western New England and New York, Pennsylvania (west of Alleghenies), Maryland, and Atlantic States to western Florida and west to the Rocky Mountains from southern Alberta to northern New Mexico.

NAMES IN USE.—Cottonwood (N. H., Vt., Mass., R. I., N. Y., N. J., W. Va., N. C., Ala., Fla., Miss., La., Tex., Cal., Ky., Mo., Ill., Wis., Kans., Nebr., Iowa, Minn., Mich., Ohio, Ont., Colo., Mont., N. Dak., S. Dak.); Big Cottonwood (Miss., Nebr.); Yellow Cottonwood (Ark., Iowa, Nebr.); Cotton-tree (N. Y.); Carolina Poplar (Pa., Miss., La., N. Mex.; Ind., Ohio); Necklace Poplar (Tex., Colo.); Vermont Poplar (Vt.); Whitewood (Iowa); Broad-leaved Cottonwood (Colo.).

VARIETIES DISTINGUISHED IN CULTIVATION.

<i>Populus deltoides aurea</i> (Nichol.) Sudw.	Goldenleaf Cottonwood.
<i>Populus deltoides erecta</i> (Selys) Sudw.	Erect Cottonwood.
<i>Populus deltoides crispa</i> (Dipp.) Sudw.	Crisp-leaf Cottonwood.

**Populus fremontii**<sup>1</sup> Wats.

**Fremont Cottonwood.**

RANGE.—Western California (Sacramento River) to Lower California; eastward to central Nevada, southern Utah and Colorado, western Texas and northern Mexico.

NAMES IN USE.—Cottonwood (Cal., Utah); White Cottonwood (N. Mex.).

**Populus alba** Linn.

**White Poplar.**

RANGE.—Europe. Widely naturalized in the United States by cultivation.

VARIETIES DISTINGUISHED IN CULTIVATION.

<i>Populus alba nivea</i> (Willd.) Loud.	Snowy Poplar.
<i>Populus alba canescens</i> (Smith) Loud.	Silver Poplar.
<i>Populus alba canescens umbraculifera</i> Sudw.	Weeping Silver Poplar.
<i>Populus alba bolleana</i> Louche.	Bolle Poplar.
<i>Populus alba nutans</i> Sudw.	Weeping White Poplar.
<i>Populus alba globosa</i> Dipp.	Roundtop Poplar.

**Populus nigra** Linn.

**Black Poplar.**

RANGE.—Europe. Naturalized in several localities in the East.

VARIETIES DISTINGUISHED IN CULTIVATION.

<i>Populus nigra italica</i> Du Roi.	Lombardy Poplar.
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*Populus nigra elegans* Bailey.

**Family BETULACEÆ.**

**BETULA** Linn.

**Betula populifolia** Marsh.

**White Birch.**

RANGE.—From Nova Scotia, New Brunswick, and Lower St. Lawrence River southward (mostly in coast region) to Delaware (Newcastle County) and westward through northern New England and New York to Lake Ontario (southern shores).

NAMES IN USE.—White Birch (Vt., Mass., R. I., Conn., N. Y., N. J., Penn., Del., Ont.); Gray Birch (Me., R. I., Mass.); Oldfield Birch; Poverty Birch (Me.); Poplar-leaved Birch; Small White Birch (Vt.).

**Betula populifolia** × **papyrifera** Sargent.

RANGE.—Massachusetts and New Hampshire—local.

<sup>1</sup> Includes *P. fremontii* var. *Wislizeni* Wats.

Staminate aments always at ends of twigs, and naked during winter.

*Betula populifolia purpurea* Hort. Am.

***Betula papyrifera* Marsh.**

**Paper Birch.**

RANGE.—From Labrador to Hudson Bay (southern shores), Great Bear Lake, Yukon River and coast of Alaska; southward to New York (Long Island) and northern Pennsylvania, central Michigan, and Minnesota, northern Nebraska (bluffs of Niobrara River), Dakota (Black Hills), northern Montana, and northwestern Washington (near Seattle).

NAMES IN USE.—Paper Birch (N. H., Vt., Mass., R. I., Conn., N. Y., Wis., Mich., Minn., Ont.); Canoe Birch (Me., Vt., N. H., R. I., Mass., N. Y., Pa., Wis., Mich., Minn., Ont.); White Birch (Me., N. H., Vt., R. I., N. Y., N. J., Wis., Minn., Mich., Nebr., Ont.); Silver Birch (Minn.); Large White Birch (Vt.); Boleau (Quebec).

***Betula papyrifera minor* (Tuck.) Wats. & Coult.**

**Alpine Paper Birch.**

RANGE.—Northern New England (mountains).

***Betula occidentalis* Hook.**

**Western Birch.**

RANGE.—From British Columbia (upper Fraser and Pease rivers) south to California (valleys of Mount Shasta and eastern slopes of the northern Sierra Nevada); eastward in British America to eastern Alberta and along the Saskatchewan River to Edmonton, and south in the Rocky Mountains and other interior ranges to Nevada, Utah, northern New Mexico; east to Dakota (Black Hills), northwestern Nebraska, and eastern base of Rockies in Colorado.

NAMES IN USE.—Black Birch (Cal., Colo., Mont., Utah); Cañon Birch (Utah); Sweet Birch (Idaho); Cherry Birch (Idaho); Gray Birch (Mont.); Water Birch (Colo.); Western Birch.

***Betula nigra* Linn.**

*Along streams.*

**River Birch.**

RANGE.—Massachusetts (Nashua River near Fitchburg; Merrimac River near Lawrence and Lowell; Spicket and Shawsheen rivers); New York (Wading River, Long Island) and southward east of the Alleghenies to western Florida; west in Gulf States to Texas (Trinity River) and north through Mississippi to Indian Territory, eastern Kansas, eastern Nebraska (Missouri River bottoms), central Minnesota, southern Wisconsin (near Madison), and Ohio.

NAMES IN USE.—Red Birch (Mass., R. I., N. Y., N. J., Pa., Del., N. C., S. C., La., Mo., Wis., Kans., Nebr., Ohio); River Birch (Mass., R. I., N. J., Del., Pa., W. Va., Ala., Miss., Tex., Mo., Ill., Wis., Ohio); Water Birch (W. Va., Kans.); Blue Birch (Ark.); Black Birch (Fla., Tenn., Tex.); Birch (N. C., S. C., Miss., La.).

***Betula lutea* Michx. f.**

**Yellow Birch.**

RANGE.—From Newfoundland and along the northern shores of St. Lawrence Gulf to Abitibi Lake and Rainy River; southward to northern Minnesota and through the Northern States to eastern Tennessee, North Carolina, and Delaware.

NAMES IN USE.—Yellow Birch (Me., N. H., Vt., Mass., Conn., R. I., N. Y., N. J., Pa., N. C., S. C., Ill., Mich., Minn., N. Dak., Ont.); Gray Birch (Vt., R. I., Pa., Mich., Minn.); Swamp Birch (Minn.); Silver Birch (N. H.); Merisier (Quebec); Merisier Rouge (Quebec).



**Betula lenta** Linn.

**Sweet Birch**

RANGE.—Newfoundland to northwestern Ontario and southward to southern Indiana and Illinois, and along the Allegheny Mountains to central Kentucky, Tennessee, and western Florida.

NAMES IN USE.—Sweet Birch (Me., N. H., Vt., Mass., R. I., N. Y., N. J., Pa., Del., S. C., Mich., Minn.); Birch (N. C.); Black Birch (N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., W. Va., Ga., Ill., Ind., Mich., Ohio); Cherry Birch (N. H., R. I., N. Y., Pa., Va., Del., S. C., S. C., Fla., Wis., Mich., Ont.); River Birch (Minn.); Mahogany Birch (N. C., S. C.); Mountain Mahogany (S. C.).

**ALNUS Ehrh.**

**Alnus maritima** (Marsh.) Muehl.

**Seaside Alder.**

RANGE.—Southern part of the peninsula of Delaware and Maryland (Nanticoke River near Seaford, Del.; Wicomico River near Salisbury, Md.); Indian Territory (Red River).

NAMES IN USE.—Seaside Alder (Del.); Alder (Del.).

**Alnus acuminata** H. B. K.

**Lanceleaf Alder.**

ALNUS OBLONGIFOLIA Torr.

RANGE.—Southern New Mexico and Arizona (canyons of mountains); southern Mexico, Central America to Peru (Andes).

**Alnus rhombifolia** Nutt.

**White Alder.**

RANGE.—From northern Idaho to the eastern slope of the Cascade Mountains of Washington and southeastern Oregon, and southward through California (coast ranges, western slopes Sierra Nevada, San Bernardino, San Jacinto, and Chayamaca mountains).

NAMES IN USE.—Alder (Cal., Oreg.); Western or California Alder (Idaho); Mountain Alder.

**Alnus tenuifolia** Nutt.

**Paperleaf Alder.**

ALNUS INCANA var. VIRESCENS Wats.

RANGE.—From British Columbia (Kicking Horse Lake to Lower Fraser River) through the Rocky Mountains to northern New Mexico, to southern California (Sierra Nevada), and Lower California.

**Alnus oregona** Nutt.

**Red Alder.**

RANGE.—From Sitka (through islands and coast ranges of British Columbia, western Washington, and Oregon) to California (coast ranges to Santa Inez Mountains, near Santa Barbara).

NAMES IN USE.—Alder (Cal., Oreg.); Red Alder (Cal., Oreg.); Western or Red Alder.

**Alnus glutinosa** (Linn.) Gaertn.

**European Alder.**

RANGE.—Europe and northern Asia, but naturalized in few localities in the United States.

VARIETIES DISTINGUISHED IN CULTIVATION.

*Alnus glutinosa quercifolia* Willd.

*Alnus glutinosa laciniata* (Ehr.) Willd.

*Alnus glutinosa incisa* Willd.

*Alnus glutinosa aurea* (Koch) Nichol.

## OSTRYA Scop.

*staminate anthers  
naked during winter*  
**Ostrya virginiana**<sup>1</sup> (Mill.) Koch.*stagnant  
leaf  
acute at base*  
**Hornbeam**

RANGE.—From Nova Scotia and Cape Breton Island and New Brunswick (Bay of Chaleur and along St. Lawrence and Lower Ottawa rivers and over northern shores of Lake Huron) to western Ontario, northern Minnesota, Dakota (Black Hills), eastern and northern Nebraska, eastern Kansas; south to northern Florida (near Jacksonville) and eastern Texas. *Wood used for fire-wood.*

NAMES IN USE.—Hop Hornbeam (Vt., R. I., Mass., N. Y., N. J., Pa., Del., N. C., S. C., Ala., Tex., Ark., Ohio, Ill., Ind., Wis., Minn., Kans., Nebr., S. Dak.); Ironwood (R. I., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Ala., Tex., Ark., Ky., Ohio, Ind., Ill., Iowa, Mich., Wis., Minn., S. Dak., Nebr., Ont.); Leverwood (Vt., Mass., R. I., N. Y., Pa., Kans.); Hornbeam (R. I., N. Y., Fla., S. C., La.); Hardhack (Vt.).

**Ostrya knowltoni** Coville.**Knowlton Hornbeam.**

RANGE.—Arizona (canyon of the Colorado River 70 miles north of Flagstaff, where Tolfee (P. O.) is located. Abundant along the trail leading to the bottom of the canyon, at 6,000 to 7,000 feet elevation). Range insufficiently understood; southern Mexico and Central America (mountains).

## CARPINUS Linn.

*leaves round  
at base*  
**Carpinus caroliniana** Walt.**Blue Beech.**

RANGE.—Southern and western Quebec to Georgian Bay (north shores) and southward to Florida (Cape Malabar and Tampa Bay); west in United States to northern Minnesota, eastern Nebraska and Kansas, Indian Territory and Texas (Trinity River).

NAMES IN USE.—Blue Beech (N. H., Vt., R. I., N. Y., Pa., Miss., Tex., Ky., Mich., Iowa, Nebr., Minn., Ohio, Ont.); Water Beech (R. I., N. Y., Pa., Del., W. Va., Ohio, Ill., Ind., Mich., Minn., Nebr., Kans.); Hornbeam (Me., N. H., Mass., Conn., R. I., N. Y., N. J., Pa., Del., N. C., S. C., Ala., Tex., Ky., Ill., Kans., Minn.); Ironwood (Me., Vt., Mass., R. I., N. Y., N. J., Pa., Del., N. C., S. C., Fla., Ala., La., Tex., Mo., Wis., Ill., Iowa, Kans., Minn., Ohio, Nova Scotia); O-tan-tah-te-weh—"A lean tree" (Indians, N. Y.). *Seeds in axils of bracts*

## Family FAGACEÆ.

## FAGUS Linn.

*staminate flowers low  
end of branch*  
**Fagus atropunicea** (Marsh.) Sudworth.*grandifolia  
Americana*  
**Beech.****FAGUS FERRUGINEA** Ait.

RANGE.—Nova Scotia to Lake Huron (north shores) and northern Wisconsin; south to western Florida and west to southeastern Missouri and Texas (Trinity River).

NAMES IN USE.—Beech (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark., Ky., Mo., Ohio, Ill., Ind., Mich., Nebr., Minn., Ont.); Red Beech (Me., Vt., Ky., Ohio); White Beech (Me., Ohio, Mich.); Ridge Beech (Ark.).

<sup>1</sup>The *Ostrya* reported from southern Mexico and Guatemala and referred to this species is probably *O. knowltoni*. I have not seen specimens of the Mexican plant.

*European species - sylvatica, has*

## CASTANOPSIS Spach.

**Castanopsis chrysophylla** (Hook.) de C. Goldenleaf Chinquapin.

RANGE.—Pacific coast region from the Columbia River along western slopes of Cascade Mountains and Sierra Nevada to southern California (San Jacinto Mountains).

NAMES IN USE.—Chinquapin (Cal., Oreg.); Chestnut (Cal.); Western Chinquapin.

## CASTANEA Adams.

**Castanea pumila** (Linn.) Mill.

Chinquapin

RANGE.—From southern Pennsylvania (Adams, York, Franklin, and Cumberland counties) to northern Florida and eastern Texas (Neches River).

NAMES IN USE.—Chinquapin (Del., N. J., Pa., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark., Ohio, Ky., Mo., Mich. (cult.).

**Castanea dentata** (Marsh.) Borkh.

tree

Chestnut

CASTANEA VESCA  $\beta$  AMERICANA Michx.

CASTANEA VULGARIS  $\gamma$  AMERICANA A. de C.

RANGE.—From southern Maine to northwestern Vermont (Winooski River), southern Ontario, and southern shores of Lake Ontario to southeastern Michigan; southward to Delaware and southeastern Indiana, and on the Allegheny Mountains to central Kentucky and Tennessee, central Alabama, and Mississippi.

NAMES IN USE.—Chestnut (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ala., Fla., Ga., Miss., Ky., Mo., Mich., Ont.); O-heh-yah-tah="Prickly Bur" (Indians, N. Y.).

White oak, mature seeds in summer usually white. Black & Red ROQUERCUS Linn.

**Quercus alba** Linn. *How pores in spring wood.* White Oak.

RANGE.—From southern Maine to southwestern Quebec and through central and southern Ontario, lower peninsula of Michigan and southern Minnesota to southeastern Nebraska and eastern Kansas; south to northern Florida and Texas (Brazos River).

NAMES IN USE.—White Oak (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ala., Fla., Ga., Miss., La., Tex., Ky., Mo., Ohio, Ill., Ind., Kans., Nebr., Mich., Wis., Minn., S. Dak. (cult.), Iowa, Ont.); Stave Oak (Ark.).

**Quercus alba**  $\times$  **macrocarpa** Engelm.

RANGE.—Illinois (near Fountaindale and Athens); Vermont (near Charlotte).

**Quercus alba**  $\times$  **minor** Coulter.

RANGE.—Illinois (Fountaindale); Maryland (Silver Springs); Missouri (Allentown).

**Quercus alba**  $\times$  **prinus** Engelm.

RANGE.—District of Columbia; Vermont (near Charlotte); Tennessee (near Fowler).

**Quercus lobata** Née.

California White Oak.

RANGE.—Western California (Sierra Nevada to the ocean, from the upper Sacramento to Tejon Pass, thence to Antelope Valley and to Santa Monica).

NAMES IN USE.—California White Oak (Cal.); Weeping Oak (Cal.); Valley Oak (Cal.); "Roble" (Mexicans); White Oak (Cal.); Swamp Oak (Cal.).

*fungi affecting oak. (most abundant)*  
Red rot — Polychorus Oculphureus (on the trees)

shrub  
white  
under  
leaves

tree  
green both sides  
of leaves  
eaten  
away  
to bleed

liap for the parasite

white oak  
trees & standing trees  
Hydnum Crinaceum (white)

**Quercus breweri** Engelm.

Shin Oak.

RANGE.—California: western slopes of Sierra Nevada from northern border of the State to Tulare County.

**Quercus garryana** Dougl.

Pacific Post Oak.

RANGE.—From southern Vancouver Island and southwestern British Columbia (lower Fraser River) south through western Washington, and Oregon and California (coast valleys to Santa Cruz Mountains).

NAMES IN USE.—White Oak (Cal., Oreg.); Oregon White Oak (Cal.); Pacific Post Oak (Oreg.); Oregon Oak (Oreg.); Western White Oak (Oreg.).

**Quercus gambelii** Nutt.

Gambel Oak.

**QUERCUS UNDULATA** = **GAMBELII** Engelm.

RANGE.—From Colorado (eastern slopes Rocky Mountains and as far north as the divide between Platte and Arkansas rivers) to Utah (Wasatch Mountains), and southward through the mountains to western Texas (Pecos River region) and southwestern Nevada (Charlestown Mountains); Mexico (mountains of northern Sonora).

NAMES IN USE.—Scrub Oak (N. Mex., Ariz., Colo., Nev., Utah); Rocky Mountain Scrub Oak (Nev.); Mountain Oak (Nev.); Pin Oak (Ariz.); White Oak; Shin Oak.

**Quercus minor** (Marsh.) Sargent.

Post Oak.

**QUERCUS OBTUSILOBA** Michx.

RANGE.—From southern Massachusetts (near Brewster, Cape Cod, and islands of Martha's Vineyard and Nausahon), Rhode Island (North Kingston), and New York (Long Island) to northern Florida, southern Alabama, and Mississippi; west from Long Island to Missouri, eastern Kansas, Indian Territory, and Texas (here south to San Antonio River and west to one hundredth meridian).

NAMES IN USE.—Post Oak (Conn., R. I., N. J., Pa., Del., W. Va., N. C., S. C., Ala., Ga., Fla., Miss., La., Tex., Ark., Ky., Mo., Ill., Ind., Iowa, Kans., Nebr., Ont.); Box White Oak (R. I.); Iron Oak (Del., Miss., Nebr.); Chêne étoile (Quebec); Overcup Oak (Fla.); White Oak (Ky., Ind.); Box Oak (Md.); Brash Oak (Md.).

**Quercus chapmani** Sargent.

Chapman Oak.

RANGE.—South Carolina to Florida (commonly near the coast).

**Quercus macrocarpa** Michx.

Bur Oak.

RANGE.—From New Brunswick and Nova Scotia westward through St. Lawrence River valley, Ontario, southwestern Manitoba (south Lake Winnipeg); from Maine (Penobscot River region), Vermont (shores Lake Champlain), Massachusetts (Ware River), Pennsylvania (Lancaster County) west to Montana (eastern base Rocky Mountains), western Nebraska, central Kansas, and southwestward into central Tennessee, Indian Territory, and Texas (to Nueces River).

NAMES IN USE.—Bur Oak (Vt., N. Y., Pa., Del., W. Va., Ala., Miss., La., Tex., Ark., Mo., Ohio, Ill., Ky., Iowa, Kans., Nebr., Wis., Mich., Minn., N. Dak., S. Dak.); Mossycup Oak (Mass., Pa., Del., Miss., La., Tex., Ark., Ill., Iowa, Nebr., Kans., Ont.); Overcup Oak (R. I., Del., Pa., Miss., La., Ill., Minn.); Blue Oak (Ont.); Scrub Oak (Nebr., Minn.); Overcup White Oak (Vt.); Mossycup White Oak (Minn.).

**Quercus lyrata** Walt.

Overcup Oak.

RANGE.—From Maryland (Potomac River near District of Columbia, and Patuxent River, 3 miles below Laurel) southward to western Florida and west through the

Sober diff. in north of Ohio. 2. lbs. Range like bald cypress. This and macrocarpa

one of largest wgs in east. seldom met in Ohio.

Chapman Oak.

Found w. o. in southern Italy.

Gulf region to Texas (Trinity River), through Arkansas, southwestern Missouri (only near Allenton), central Tennessee, southern Indiana, Illinois (Rafes Mill on Embarras River in southeastern Jasper County).

**NAMES IN USE.**—Overcup Oak (N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ark., Ill.); Swamp Post Oak (Ala., S. C., Miss., La., Mo.); Water White Oak (S. C., Miss.); Oak (Ala.); Swamp White Oak (Tex.).

**Quercus prinus** Linn.

Chestnut Oak.

**RANGE.**—From southern Maine (Saco River) and Mount Agamenticus and eastern Massachusetts (Blue Hills) to Maryland (District of Columbia), and in the mountains to northern Georgia and Alabama; westward to Lake Champlain and the Genesee River in New York, to Lake Erie (northern shores from Niagara River to Amhurstburg), to central Kentucky and Tennessee.

**NAMES IN USE.**—Chestnut Oak (Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., Ga., Ky.); Rock Chestnut Oak (Mass., R. I., Pa., Del., Ala.); Rock Oak (N. Y., Del., Pa.); Tanbark Oak; Swamp Chestnut Oak (N. C.); Mountain Oak (Ala.).

**Quercus acuminata** (Michx.) Honba.

Chinquapin Oak.

**RANGE.**—From New York (Gardener's Island in Lake Champlain and on Hudson River north of Newburg) westward through southern Ontario to southeastern Nebraska and eastern Kansas; southward in the Atlantic region to the District of Columbia (and upper Potomac River), and west of the Allegheny Mountains to central Alabama and Mississippi, through Arkansas and northern Louisiana to the eastern border of Indian Territory and Texas (to Nueces River, and canyons of Guadalupe Mountains in extreme western part of State).

**NAMES IN USE.**—Chestnut Oak (Conn., Del., Ala., N. C., Miss., La., Tex., Ohio, Ill., Mich., Kans., Nebr.); Chinquapin Oak (Mass., R. I., Pa., Del., N. C., S. C., Ala., Ark., Miss., Tex., Mo., Ind., Nebr., Kans.); Pin Oak (Kans., Ark.); Yellow Oak (Ill., Kans., Nebr., Mich.); Scrub Oak (N. Y.); Dwarf Chestnut Oak (Mass., N. C., Tenn.); Shrub Oak (Nebr.); White Oak (Tenn.); Rock Oak (Ark.).

**Quercus prinoides** Willd.

Dwarf Chinquapin Oak.

**RANGE.**—Massachusetts (Essex County) to North Carolina and westward to southeastern Nebraska, central Kansas, Indian Territory, and eastern Texas. Range imperfectly understood. *On sandy stretches east of Washington.*

**Quercus platanoides** (Lam.) Sudworth.

Swamp White Oak.

**QUERCUS BICOLOR** Willd.

**RANGE.**—From southern Maine to northern Vermont and southwestern Quebec; west through Ontario and southern peninsula of Michigan to southeastern Iowa and western Missouri; south to the District of Columbia, northern Kentucky and Arkansas, and along the Appalachian Mountains to northern Georgia.

**NAMES IN USE.**—Swamp White Oak (Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., W. Va., Mo., Ill., Ind., Iowa, Mich., Ont.); Swamp Oak (R. I., Pa., Mich.).

**Quercus michauxii** Nutt.

**RANGE.**—From Delaware (near Wilmington) to northern Florida; west through the Gulf region to Texas (Trinity River), and through Arkansas and southeastern Missouri to central Tennessee and Kentucky, Illinois, and Indiana (in valley lower Wabash River). *Leaves whitish beneath.*

**NAMES IN USE.**—Basket Oak (Ala., Miss., La., Tex., Ark.); Cow Oak (Ala., Miss., Tex., Ark., Mo.); Swamp White Oak (Del., Ala.); Swamp Chestnut Oak (Fla.).

all oaks very resistant to crushing; good for flooring; good for posts; good for poles; good for rails; good for shingles; good for cooperage; good for shipbuilding; good for furniture; good for all purposes.

*White underneath leaves.*

*48 lbs.*

*Basket*

*Cow Oak.*

*50 lbs.*

**Quercus michauxii** × **macrocarpa** Sudworth.

RANGE.—Southwestern Tennessee (near Covington).

**Quercus breviloba** (Torr.) Sargent.**Durand Oak.****QUERCUS DURANDII** Buckl.

RANGE.—Central Alabama (and to Mulberry Fork of Tombigbee River, in Blount County) and Mississippi (near Columbus and near Mhoons Valley); Louisiana (Red River near Shreveport); Texas (from near Dallas west to central part of the State and southward on streams flowing into the Gulf to near Monterey).

NAMES IN USE.—White Oak (Tex.); Texas White Oak (Ala.); Shin Oak (Tex.); Pin Oak (Tex.); Bastard Oak (Ala., La., Tex.); Basket Oak (Ala., La., Tex.); Durand's Oak (Ala., La., Tex.).

*rest  
erative  
in  
aves  
wings  
conts* **Quercus undulata** Torr. *along river  
canyon.* **Rocky Mountain Oak.**

RANGE.—Colorado to western Texas (mountains) and through New Mexico and Arizona to southern Utah and Nevada; northern Mexico. *Shrubby  
generally.*

NAMES IN USE.—Scrub Oak; Shin Oak.

**Quercus douglasii** Hook. & Arn.**(California) Rock Oak.**

RANGE.—California (from Mendocino County and valley of upper Sacramento River southward on westward slopes of Sierra Nevada and valleys of the coast ranges to the Tehachapi Pass and across to the border of the Mohave Desert).

NAMES IN USE.—Mountain White Oak (Cal.); Rock Oak (Cal.); White Oak (Cal.); Blue Oak (Cal.). *short large trunk*

**Quercus engelmanni** Greene.**Engelmann Oak.**

RANGE.—Southwestern California (in a belt 15 miles wide from vicinity of Sierra Madre to the mesa east of San Diego).

NAMES IN USE.—Engelmann's Oak; Evergreen White Oak.

**Quercus oblongifolia** Torr.**Blue Oak.**

RANGE.—Western Texas (Chisos Mountains) through southern New Mexico and Arizona, and south into northern Mexico.

NAME IN USE.—White Oak. *short large trunk*

**Quercus arizonica** Sargent.**Arizona White Oak.**

RANGE.—Southern New Mexico and Arizona.

NAME IN USE.—White Oak. *Evergreen.*

*small* **Quercus reticulata** Humb. & Bonpl. **Netleaf Oak.**

RANGE.—Southern New Mexico (Mount Graham, Santa Rita, Huachuca, Chiricahua, and Santa Catalina mountains) and Arizona (San Luis and Animas mountains).

**Quercus toumeyi** Sargent.**Toumey Oak.**

RANGE.—Southeastern Arizona (Mule Mountain, Cochise County)

*small* **Quercus dumosa** Nutt. **(California) Scrub Oak.**

RANGE.—California (western slopes of Sierra Nevada; coast ranges south of San Francisco Bay; islands off southern coast and inland to Mohave Desert; San Bernardino and San Jacinto mountains); Lower California (to near San Telmo).

**Quercus dumosa revoluta** Sargent.**Curl-leaf Scrub Oak.**

RANGE.—Northern California (San Francisco Bay to Mendocino County and Napa Valley).

*Annual rings hardly distinguishable*  
**Quercus virginiana** Mill.

**QUERCUS VIRENS** Ait.

**RANGE.**—From Virginia (shores of Mobjack Bay), on islands and near the coast, to and through southern Florida (Biscayne Bay) and along the Gulf coast (from Cape Romano) to western Texas (mouth of Rio Grande River and inland to the Red River and Apache and Guadalupe mountains); Lower California (Miraflores), southern Mexico, Central America, and Cuba.

**NAMES IN USE.**—Live Oak (Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Cal.); Chene Vert (La.).

**Quercus emoryi** Torr.

**Emory Oak.**

**RANGE.**—Mountains of western Texas and of New Mexico and Arizona south of the Colorado plateau; Mexico (mountains of Nuevo Leon, Chihuahua, and Sonora).

**NAMES IN USE.**—Emory's Oak (Cal.); Black Oak (Ariz., N. Mex.).

**Quercus chrysolepis** Liebm.

**Canyon Live Oak.**

**RANGE.**—From southern Oregon (Cow Creek Valley) through California (coast ranges, western slopes Sierra Nevada, San Bernardino, San Jacinto, and Cuyamaca mountains) to Lower California (Mount San Pedro Martir); (and mountain summits) southern Arizona and New Mexico; Mexico (northern Sonora).

**NAMES IN USE.**—Live Oak (Cal., Oreg.); Maul Oak (Cal.); Iron Oak (Cal.); Valparaiso Oak (Cal.); Black Live Oak (Cal.); Canyon Live Oak (Cal.); Canyon Oak (Cal.); Golden-cup Oak (Cal.); Hickory Oak (Kern County, Cal.).

**Quercus chrysolepis palmeri** Engelm.

**Palmer Oak.**

**RANGE.**—Boundary between California and Lower California.

**Quercus chrysolepis vaccinifolia** (Kell.) Engelm. **Huckleberry Oak.**

**RANGE.**—California (highest elevations Sierra Nevada).

**Quercus tomentella** Engelm. **Acorn matures in 2 seasons**

**RANGE.**—Santa Rosa, Santa Cruz (south of Santa Barbara), Santa Catalina Islands, south of Cape Vincent, off coast of California; Guadalupe Islands, off coast of Lower California.

**Quercus agrifolia** Née.

**California Live Oak.**

**RANGE.**—From northern California (Mendocino County and along the coast ranges and islands) to Lower California (Mount San Pedro Martir).

**NAMES IN USE.**—Coast Live Oak (Cal.); California Live Oak (Cal.); Encina (Cal.); Evergreen Oak (Cal.).

**Quercus hypoleuca** Engelm.

**Whiteleaf Oak.**

**RANGE.**—From western Texas (Limpio Mountains) over mountains of New Mexico and Arizona, south of the Colorado Plateau; Mexico (northern Chihuahua and Sonora).

**NAMES IN USE.**—Oak (Ariz.); Mexican Oak; White leaved Oak.

<sup>1</sup>Dr. J. K. Small has recently described the following species as new. I have not seen specimens of it, but it appears to be very closely related to *Quercus virginiana*.

*Quercus geminata* Small (Bull. Torr. Bot. Club, vol. 21, p. 138, 1897). A shrub or small tree 6 to 15 feet high. "Leaves narrowly oblong, elliptic, or oblong-ob lanceolate, 3-6 cm. long, entire, obtuse or apiculate, strongly revolute, mostly gradually narrowed at the base, glabrous and parchment-like above, finely tomentose and conspicuously rugose on the prominent nerves beneath; acorns, usually 2 at the end of a peduncle; cups turbinate." Florida (sandy soil).

*On tropics there are often no annual rings or secondary rings which show lacunae etc.*

**Quercus wislizeni A. de C.****Highland Oak.**

RANGE.—From northern California (lower slopes Mount Shasta and southward through the coast region to Santa Lucia Mountains, Santa Rosa and Santa Cruz Islands, and lower slopes of Sierra Nevada to Tizon Pass; San Bernadino, San Jacinto, and Cuyamaca mountains) to Lower California (Mount San Pedro Martir).

NAMES IN USE.—Live Oak (Cal.); Highland Live Oak (Cal.).

**Quercus morehus Kell.****Morehus Oak.**

RANGE.—California (Lake County).

**Quercus myrtifolia Willd.****Myrtle Oak.**

RANGE.—From South Carolina (on coast and islands) to eastern Florida, and from Biscayne Bay to eastern Louisiana.

**Quercus rubra Linn. *Lomas Everhartii (fung)* Red Oak.**

RANGE.—Nova Scotia and southern New Brunswick through Quebec and along the north shores of Lake Huron to near Lake Namekagon; south to Middle Tennessee and Virginia, and along the Appalachian Mountains to northern Georgia; west to eastern Nebraska, central Kansas.

NAMES IN USE.—Red Oak (Me., Vt., N. H., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ark., Mo., Ky., Ill., Ind., Iowa, Nebr., Kans., Mich., Minn., S. Dak., Ont.); Black Oak (Vt., Conn., N. Y., Wis., Iowa, Nebr., S. Dak., Ont.); Spanish Oak (Pa., N. C.).

**Quercus rubra runcinata A. de C.**

RANGE.—Missouri (bottom lands opposite St. Louis).

**Quercus texana Buckl.****Texan Oak.**

RANGE.—From northeastern Iowa (near Waterloo) and central Illinois through southern Illinois and Indiana, western Kentucky and Tennessee to Florida (valley Apalachicola River) and through southern Missouri, Arkansas, and Louisiana to western Texas (Limpio Mountains). Range imperfectly known.

NAMES IN USE.—Red Oak (Tex.); Spotted Oak (Tex.); Spanish Oak (Tex.).

**Quercus coccinea Muenchh.****Scarlet Oak.**

RANGE.—From Maine (Androscoggin River) through southern New Hampshire and Vermont and central New York to southern Ontario; west through central Michigan and Minnesota to southeastern Nebraska, and south to the District of Columbia, northern Illinois, and on the Allegheny Mountains to North Carolina and eastern Tennessee.

NAMES IN USE.—Scarlet Oak (Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., N. C., Mo., Ill., Ind., Wis., Minn., Mich., Nebr., Iowa, Ont.); Red Oak (N. C., Ala., Wis., Nebr., Minn.); Black Oak (Mo., Ill., Iowa, Wis.); Spanish Oak (N. C.).

**Quercus coccinea x pumila Sudworth.**

RANGE.—Massachusetts (near Wilmerville).

**Quercus velutina Lam.**

*white beneath* *Blade*  
*yellow underneath* *Yellow Oak.*

**QUERCUS TINCTORIA Barr.**

RANGE.—From southern Maine (coast) to northern Vermont, southern and western Ontario and central Minnesota; south to northern Florida, west to eastern Kansas, Indian Territory, and eastern Texas.

NAMES IN USE.—Black Oak (Vt., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ohio, Ill., Iowa, Kans., Nebr., Mich., Wis., Minn., Ont.); Quercitron Oak (Del., S. C., La.,

*Polyporous Obtusus — fungus*



Kans., Minn.); Yellow Oak (R. I., N. Y., Ill., Tex., Kans., Minn.); Tanbark Oak (Ill.); Yellow-barked Oak (Minn.); Spotted Oak (Mo.); Yellow-bark (R. I.); Dyer's Oak (Tex.).

**Quercus californica** (Torr.) Coop.

**California Black Oak.**

RANGE.—From western Oregon (McKinzie River) to the southern boundary of California (through coast mountains and on western slopes of Sierra Nevada, San Bernardino, San Jacinto, and Cuyamaca mountains).

NAMES IN USE.—Black Oak (Cal., Oreg.); Mountain Black Oak (Cal.); Kellogg's Oak (Cal.); California Black Oak (Cal.).

**Quercus catesbæi** Michx.

**Turkey Oak.**

RANGE.—In coast region from North Carolina to Florida (Cape Malabar and Pease Creek) and west to eastern Louisiana.

NAMES IN USE.—Turkey Oak (Fla., Ga., Ala., Miss., La.); Scrub Oak (N. C., S. C., Fla., Miss.); Black Jack (S. C.); Barren Scrub Oak; Forked-leaf (S. C.); Forked-leaf Black Jack.

**Quercus catesbæi** × **brevifolia** Sudworth.

RANGE.—Florida (Lake County).

**Quercus catesbæi** × **laurifolia** Engelm.

RANGE.—South Carolina (Bluffton).

**Quercus sinuata** (Lam.) Walt.

RANGE.—South Carolina (near Bluffton; tree now destroyed.)

**Quercus digitata** (Marsh.) Sudworth.

**Spanish Oak.**

**QUERCUS FALCATA** Michx.

RANGE.—From southern New Jersey to central Florida and through the Gulf States to eastern Texas (Brazos River), Arkansas, southwestern Missouri to middle Tennessee and Kentucky, southern Illinois and Indiana.

NAMES IN USE.—Spanish Oak (Del., Va., N. C., S. C., Ala., Fla., Miss., La., Tex., Mo., Ill.); Red Oak (N. C., Va., Ga., Fla., Ala., Miss., La., Ind.); Spanish Water Oak (La.).

**Quercus digitata** × **velutina** Sudworth.

RANGE.—Tennessee (near Covington).

**Quercus palustris** Muenchh.

**Pin Oak.**

RANGE.—From Massachusetts (Connecticut River, near Amherst) to southeastern Missouri, and south to Virginia (Lower Potomac River), central Kentucky, northern Arkansas, and eastern border of Indian Territory.

NAMES IN USE.—Pin Oak (Mass., Conn., R. I., N. Y., Pa., Del., Va., Md., Ark., Mo., Ill., Wis., Iowa, Kans.); Swamp Spanish Oak (Ark., Kans.); Water Oak (R. I., Ill.); Swamp Oak (Pa., Ohio, Kans.); Water Spanish Oak (Ark.).

**Quercus pumila** (Marsh.) Sudworth.

**Barren Oak.**

**QUERCUS ILCIFOLIA** Wang.

RANGE.—From Maine (Mount Desert Island off the coast) through eastern and northern New England; in New York (Lake George and valley of Hudson River); New Jersey (pine barrens); eastern Pennsylvania (and along the Allegheny Mountains—east in Maryland to Montgomery County) to northwestern North Carolina (King and Crowders mountains).

NAMES IN USE.—Bear Oak; Barren Oak (Md.); Dwarf Black Oak; Scrub Oak.

Rich in tannin cooking oil from? fruit leaves dry

**Quercus georgiana** Curtis.**Georgia Oak.**

RANGE.—Central Georgia (Stone Mountain, Little Stone Mountain, 9 miles south of Stone Mountain, and other granite hills 12 to 18 miles eastward in Dekalb County).

**Quercus georgiana** × **marilandica** Sargent.

RANGE.—Central Georgia (Stone Mountain, Dekalb County).

**Quercus marilandica** Muenchh.**Black Jack.**

**QUERCUS NIGRA** of authors, not of L.

RANGE.—From New York (Forbells Landing and Pine Island, Long Island) through northern Ohio, Indiana, and southern Michigan (Ann Arbor and Lansing) to southeastern Nebraska, central Kansas, and Indian Territory; south to Florida (Matanzas Inlet and Tampa Bay) and west to Texas (Nueces River).

NAMES IN USE.—Black Jack (Pa., Del., W. Va., N. C., S. C., Ga., Ala., Miss., La., Tex., Ark., Mo., Ill., Ind., Kans., Nebr., Mich., Minn., Iowa., S. Dak.); Jack Oak (N. Y., W. Va., Miss., Tex., Mo., Ohio, Ill., Kans., Nebr.); Iron Oak (Tenn.); Black Oak (Ark., Wis.); Barren Oak (Kans., Tenn.); Barrens Oak (Fla.); Scrub Oak (S. C.).

**Quercus marilandica** × **velutina** Bush.

RANGE.—Indian Territory (near Sapula).

**Quercus brittoni** Davis.**Britton Oak.**

RANGE.—New York (Watchogue, Staten Island).

**Quercus nigra** Linn.**Water Oak.**

**QUERCUS AQUATICA** Walt.

RANGE.—Southern Delaware to Florida (Cape Malabar and Tampa Bay); west to the Appalachian Mountains and through the Gulf States to Texas (Colorado River); through Arkansas and eastern border of Indian Territory to southeastern Missouri (Black River), middle Tennessee, and Kentucky.

NAMES IN USE.—Water Oak (Del., N. C., S. C., Ala., Fla., Miss., La., Tex., Ark., Mo.); Spotted Oak (Tex., Ala.); Duck Oak; Possum Oak; Punk Oak.

**Quercus laurifolia** Michx.**Laurel Oak.**

RANGE.—Coast region from southeastern Virginia (Dismal Swamp) to Florida (Mosquito Inlet and Cape Romano) and west in the Gulf region to Louisiana.

NAMES IN USE.—Laurel Oak (N. C., S. C., Ala., Fla.); Swamp Laurel Oak (Tenn.); Darlington Oak (S. C.); Willow Oak (Fla., S. C.); Water Oak (Ga.).

**Quercus brevifolia** (Lam.) Sargent.**Blue Jack.**

**QUERCUS CINEREA** Michx.

RANGE.—From North Carolina (in a maritime belt 40 to 50 miles inland) to Florida (Cape Malabar and Pease Creek across the peninsula); west on Gulf coast to Texas (Brazos River and inland as far as Dallas).

NAMES IN USE.—Upland Willow Oak (N. C., Ala., Tex.); Blue Jack (N. C., Fla., Tex., Ga.); Sand Jack (Tex.); High-ground Willow Oak (S. C.); Turkey Oak (S. C., Ga.); Shm Oak (Tex.); Cinnamon Oak (Fla.).

**Quercus imbricaria** Michx.**Shingle Oak.**

RANGE.—From Pennsylvania (Lehigh County) west through southern Michigan (Washtenaw County, Kalamazoo County), and Wisconsin to northern Missouri and

northeastern Kansas; south to the District of Columbia and (in the Allegheny Mountains) to northern Georgia and Alabama, to middle Tennessee and northern Arkansas.

**NAMES IN USE.**—Shingle Oak (Del., N. C., S. C., Ky., Mo., Ind., Ill., Kan., Iowa, Nebr.); Laurel Oak (Pa., Del., S. C., Ky., Ill., Nebr.); Jack Oak (Ill.); Water Oak (N. C.).

***Quercus imbricaria* × *palustris* Engelm**

**RANGE.**—Missouri (8 miles west of St. Louis; but tree since destroyed).

***Quercus tridentata* (de C.) Engelm.**

**Trident Oak.**

**RANGE.**—Missouri (near St. Louis—but tree now destroyed—and near Allentown) and Michigan (Washtenaw County).

***Quercus leana* Nutt.**

**Lea Oak.**

**RANGE.**—Ohio (near Cincinnati); District of Columbia and western North Carolina to southern Michigan, central and northern Illinois, and southeastern Missouri. Range imperfectly known.

***Quercus phellos* Linn.**

**Willow Oak.**

**RANGE.**—From New York (Tottenville, Staten Island) to northeastern Florida—usually in the low maritime plain, and through the Gulf region to Texas (Sabine River), and through Arkansas to southeastern Missouri, central Tennessee, and southern Kentucky.

**NAMES IN USE.**—Willow Oak (R. I., N. Y., Pa., Del., Ala., N. C., S. C., Fla., Miss., La., Tex., Ark., Mo.); Peach Oak (N. J., Del., Ohio); Water Oak (S. C.); Swamp Willow Oak (Tex.).

***Quercus phellos* × *digitata* Small.**

**RANGE.**—North Carolina (Stanley County).

***Quercus phellos* × *pumila* Sudworth.**

**RANGE.**—New Jersey (Mays Landing).

***Quercus heterophylla* Michx. f.**

**Bartram Oak.**

**RANGE.**—Pennsylvania (near Philadelphia—but tree long since destroyed); New Jersey (near Camden); Delaware (Wilmington); New York (Staten Island); Virginia (near Alexandria); District of Columbia; western North Carolina; Tennessee (Coffee County); Alabama (near Falkville); Texas (Houston).

**NAMES IN USE.**—Bartram's Oak (Del., Ala.); Burriers Oak (lit.).

***Quercus subimbricaria* (de C.) Sudworth.**

**QUERCUS PHELLOS × TINCTORIA Gray.**

**QUERCUS PHELLOS × NIGRA Britt.**

**RANGE.**—New Jersey (between Keyport and South Amboy); New York (Staten Island); North Carolina (Yadkin River); South Carolina (near Aiken).

***Quercus densiflora* Hook. & Arn.**

**‘(California) Tanbark Oak. *densiflora***

**RANGE.**—Southern Oregon (Umpqua River) and southward through California (coast ranges to Santa Inez Mountains—east of Santa Barbara, and western slopes of the Sierra Nevada to Mariposa County).

**NAMES IN USE.**—Tanbark Oak (Cal.); Chestnut Oak (Cal.); California Chestnut Oak (Oreg.); Peach Oak (Oreg.); Live Oak (Oreg.).

***Quercus densiflora echinoides* (R. Br. Campst.) Sargent.**

**RANGE.**—Southern Oregon (Canyon Creek) and northern California (Mount Shasta and Sierra Nevada).

Family **ULMACEÆ.***Perfect flowers but not always complete.***ULMUS** Linn.***Ulmus crassifolia* Nutt.****Cedar Elm.**

RANGE.—From Mississippi (Sunflower River) through southern Arkansas and Texas (from coast to the Pecos River) to Mexico (Nuevo Leon). *It grows in the*

NAMES IN USE.—Cedar Elm (Tex.); Red Elm (Tex.); Basket Elm (Ark.).

***Ulmus pubescens* Walt.****Slippery Elm.****ULMUS FULVA Michx.**

RANGE.—From Lower St. Lawrence River (Orleans Island) through Ontario to North Dakota and eastern Nebraska; south to western Florida, central Alabama, and Mississippi and Texas (San Antonio River).

NAMES IN USE.—Slippery Elm (Vt., N. H., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Fla., Ala., Ga., Miss., La., Tex., Ky., Mo., Kans., Nebr., Ohio, Ill., Ind., Wis., Mich., Iowa, Minn., Ont.); Red Elm (Vt., Mass., N. Y., Del., Pa., W. Va., S. C., Ala., Miss., La., Tex., Ark., Ky., Mo., Ill., Kans., Nebr., Iowa, Ohio, Ont., Wis., Mich., Minn.); Red wooded Elm (Tenn.); Rock Elm (Tenn.); Orme gras (La.); Moose Elm; Oo-hoosk-ah="It slips" (Indians, N. Y.).

***Ulmus americana* Linn.****White Elm.**

RANGE.—From southern Newfoundland to Lake Superior (north shores) and to the eastern base of the Rocky Mountains (here up the Saskatchewan River to latitude 51° 30'); south to Florida (Cape Canaveral and Pease Creek); west to Dakota (Black Hills), western Nebraska, western Kansas, Indian Territory, and Texas (Rio Concho River).

NAMES IN USE.—American Elm (Vt., Mass., R. I., N. Y., Del., Pa., N. C., Miss., Tex., Ill., Ohio, Kans., Nebr., Mich., Minn., Ont.); White Elm (Me., N. H., Vt., Mass., R. I., N. Y., Pa., N. J., Del., Va., W. Va., N. C., S. C., Ala., Fla., Miss., La., Tex., Ark., Ky., Mo., Ill., Ind., Kans., Nebr., Ohio, Ont., Iowa, Mich., Minn., N. Dak., S. Dak.); Water Elm (Miss., Tex., Ark., Mo., Ill., Iowa, Mich., Ohio, Minn., Nebr.); Elm (Mass., R. I., Conn., N. J., Pa., N. C., S. C., Iowa, Wis.); Orme Maigre (La.); Swamp Elm; Rock Elm.

## VARIETY DISTINGUISHED IN CULTIVATION.

***Ulmus americana pendula* Ait.****Weeping American Elm.*****Ulmus racemosa* Thomas.****Cork Elm.**

RANGE.—From Quebec (eastern townships) through Ontario, and south through northwestern New Hampshire to southern Vermont; westward through northern New York, southern Michigan, and Wisconsin (Lake Mendota, near Madison) to northeastern Nebraska (Meadville, Keyapaha County), southeastern Missouri, and middle Tennessee.

NAMES IN USE.—Cork Elm (Vt., Mass., R. I., N. Y., N. J., Ark., Ky., Mo., Wis., Mich., Ohio, Iowa); Rock Elm (R. I., W. Va., Ky., Mo., Ill., Wis., Iowa, Mich., Nebr., Ont.); Hickory Elm (Mo., Ill., Ind., Iowa).

White Elm (Ont.); Thomas Elm (Tenn.); Northern Cork-barked Elm (Tenn.); Corkbark Elm (N. Y.); Northern Cork Elm (Vt.); Wahoo (Ohio); Cliff Elm (Wis.); Corky White Elm.

**Ulmus alata Michx.**

**Wing Elm.**

RANGE.—From southern Virginia to western Florida, and from southern Illinois and Indiana through western Kentucky and Tennessee to the Gulf, and west through southern Missouri, Arkansas, eastern Indian Territory, and Texas (to Trinity River).

NAMES IN USE.—Winged Elm (N. C., S. C., Ark., Tex., Ill., Ind.); Wahoo (W. Va., N. C., S. C., La., Tex., Ky., Mo.); Wahoo Elm (Mo.); Witch Elm (W. Va.); Elm (W. Va.); Cork Elm (Fla., S. C., Tex.); Water Elm (Ala.); Small-leaved Elm (N. C.); Red Elm (Fla., Ark.); Whahoo (S. C.); Corky Elm (Tex.); Mountain Elm (Ark.).

**PLANERA Gmelin.**

**Planera aquatica (Walt.) Gmel.**

**Planertree.**

RANGE.—From North Carolina (Cape Fear River) to western Florida, and west through southern Alabama and Mississippi to Texas (Trinity River); northward through western Louisiana and Arkansas to southern Missouri, west Tennessee (Brownsville), central Kentucky, and Illinois (to lower Wabash River).

NAMES IN USE.—American Planertree (Ala.); Planertree (N. C., S. C., Fla., La., Tex., Ark., Tenn.); Water Elm (Fla.); Sycamore (N. C.); Plene (La.).

**CELTIS<sup>1</sup> Linn.**

**Celtis occidentalis Linn.**

**Hackberry.**

RANGE.—From St. Lawrence River (St. Helens Island, near Montreal) to southern Ontario; in the United States from Massachusetts (Massachusetts Bay) to north-western Nebraska, North Dakota, southern Idaho (Boise City), eastern Washington and Oregon (Snake River), western Washington (Puget Sound), Nevada<sup>2</sup> (East Humboldt Mountains), New Mexico, and south to Florida (Biscayne Bay and Cape Romano), middle Tennessee, Missouri, eastern Kansas, Indian Territory, and eastern Texas.

NAMES IN USE.—Hackberry (N. H., Vt., R. I., N. Y., N. J., Del., Pa., W. Va., N. C., S. C., Ala., Fla., Miss., La., Tex., Ariz., Ark., Ky., Mo., Ill.,

<sup>1</sup>Dr. J. K. Small has recently described the following new species, specimens of which I have not seen:

*Celtis Georgiana* Small (Bull. Torr. Bot. Club, vol. 24, p. 439, 1897). "A low species ('diffuse shrub') related to *C. pumila*, from which it may be distinguished by its smaller, nearly acute leaves, the very short pedicels, and smaller tan-colored drupes." North central Georgia (Yellow River Valley, near McGuire's mill in Gwinnett County, and in vicinity of Stone Mountain).

*Celtis Helleri* Small (l. c.). A tree about 30 feet high and 3 feet in diameter, with much branched and wide-spreading crown. Bark of trunk and main branches with corky warts. The leaves are described as "rather firm, the blades ovate to oblong, 4 to 7 cm. long, obtuse or acute, crenate-serrate, rounded or subcordate at the base. . . . scabrous pubescent above, pale and tomentose beneath." Between San Antonio and San Antonio River, Texas. This tree appears to be very closely related to *Celtis occidentalis reticulata*.

<sup>2</sup>Shrubby variety, *C. occidentalis pumila* Gr., common from South Atlantic States to Missouri, Colorado, Utah, and Nevada.

Ind., Wis., Iowa, Kans., Nebr., Mich., Minn., S. Dak., Ohio, Ont.); Sugarberry (N. Y., Pa., Del., N. C., S. C., Minn.); Nettle-tree (R. I., Mass., Del., Mich.); American Nettle-tree (Tenn.); Hoop Ash (Vt.); One-berry (R. I.); Hack-tree (Minn.); Juniper-tree (N. J.); Bastard Elm (N. J.).

**Celtis occidentalis reticulata** (Torr.) Sargent.

**Palo Blanco.**

RANGE.—From eastern Texas (Dallas) to the Rio Grande River and through New Mexico and Arizona to southern Utah, Nevada, California (western rim of Colorado Desert); Lower California (San Julio Canyon and Cerros Island).

NAMES IN USE.—Hackberry (Tex.); Palo Blanco (Tex.).

**Celtis mississippiensis** Bosc.

**Sugarberry.**

RANGE.—From southern Indiana and Illinois through Kentucky and Tennessee to Florida (Biscayne Bay), and through Missouri, Arkansas, and Texas to Mexico (Nuevo Leon).

NAMES IN USE.—Sugarberry (Fla., Ala., Miss.); Connu (La.); Bois inconnu (La.); Hackberry (Tenn.).

to the those of elm.  
Family MORACEÆ.

MORUS Linn.

**Morus rubra** Linn.

**Red Mulberry.**

RANGE.—From western Massachusetts and New York (Long Island) to southern Ontario, central Michigan, southeastern Nebraska, eastern Kansas; south to Florida (Biscayne Bay and Cape Romano) and Texas (Colorado River).

NAMES IN USE.—Red Mulberry (Me., Vt., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., Fla., Ala., Ga., Miss., La., Tex., Ark., Ky., Mo., Ohio, Mich., Ill., Ind., Kans., Nebr., Ont.); Mulberry (Pa., N. C., S. C., Fla., Ala., Ark., Tex., Ky., Mo., Ohio, Ill., Iowa, Nebr.); Black Mulberry (N. J., Pa., W. Va.); Virginia Mulberry-tree (Tenn.); Murier Sauvage (La.).

**Morus celtidifolia** H. B. K.

**Mexican Mulberry.**

RANGE.—From Texas (south from the Colorado River and mountains of western part of the State) and southern New Mexico to Arizona (Santa Rita Mountains); Mexico (from Nuevo Leon to Chihuahua and through southern Mexico) to Central America and Peru.

NAME IN USE.—Mexican Mulberry (Tex.).

**Morus alba** Linn.

**White Mulberry.**

RANGE.—China; but widely cultivated and naturalized in the United States.

#### VARIETIES DISTINGUISHED IN CULTIVATION.

**Morus alba tatarica** (Linn.) Loud.

**Russian Mulberry.**

**Morus alba rosea** Loud.

**Morus alba macrophylla** (Moretti) Loud.

**Largeleaf Mulberry.**

**Morus alba vulgaris tokwa** (Sieb.) Bur.

**Morus alba pyramidalis** Seringe.

**Morus alba pendula** (Dipp.) Sudw.

**Morus alba constantinopolitana** (Poir.) Loud.

**Morus alba multicaulis** (Parr.) Loud.

**Morus alba venosa** Delile.

more spiny when clipped back than when left to grow.

**BROUSSONETIA** L'Her.

**Broussonetia papyrifera** Vent.

**Paper Mulberry.**

RANGE.—Japan. Cultivated and naturalized in the Southern States.

Indian believed it was connected with the religious here they planted it

**Toxylon pomiferum** Raf.

**Osage Orange.**

**MACLURA AURANTIACA** Nutt.

RANGE.—From southern Arkansas (south of Arkansas River) through southeastern Indian Territory and southern Texas (to about latitude 35° 56'). Widely distributed elsewhere by cultivation.

NAMES IN USE.—Osage Orange (Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Miss., La., Tex., Ky., Mo., Ohio., Ill., Kans., Nebr., Iowa, Mich.); Bois D'Arc (La., Tex., Mo.); Bodock (Kans.); Mock Orange (La.); Bow-wood (Ala.); Osage Apple-tree (Tenn.); Yellow-wood (Tenn.); Hedge (Ill.); Hedge-plant (Iowa, Nebr.); Osage (Iowa).

#### VARIETY DISTINGUISHED IN CULTIVATION.

**Toxylon pomiferum inerme** André.

**Thornless Osage Orange.**

Tropical

**FICUS** Linn.

mostly vine like

**Ficus aurea** Nutt.

**Golden Fig.**

RANGE.—Southern Florida (shores and islands from Indian River on the east coast, and Tampa Bay on the west coast to the southern keys); Bahama Islands.

NAMES IN USE.—Wild Fig (Fla.); India-Rubber-tree (Fla.); Wild Rubber-tree (Fla.); Rubber-tree (Fla.).

**Ficus populnea** Willd.

**Poplarleaf Fig.**

**FICUS PEDUNCULATA** Nutt.

RANGE.—Florida (Biscayne Bay region and Key Largo, Umbrella Key, Boca Checa Key, Pumpkin Key, and Key West); West Indies.

NAMES IN USE.—Wild Fig (Fla.); India-Rubber-tree (Fla.).

## Family **POLYGONACEÆ.**

### **COCCOLOBIS** Browne.

**Coccolobis uvifera** (Linn.) Sargent.

**Sea Grape.**

RANGE.—Southern Florida (shores from Mosquito Inlet on the east coast to the southern keys, and from Tampa Bay on the west coast to Cape Sable); Bermuda and Bahama Islands, West Indies, and in South America from Colombia to Brazil.

NAMES IN USE.—Sea Grape (Fla.); Seaside Plum.

**Coccolobis laurifolia** (Jacq.) Sargent.

**Pigeon Plum.**

**COCCOLOBA FLORIDANA** Meisn.

RANGE.—Southern Florida (east coast from Cape Canaveral to the southern keys, and on the west coast from Cape Romano to Cape Sable); Bahamas, West Indies, and Venezuela.

NAME IN USE.—Pigeon Plum (Fla.)

## Family NYCTAGINACEÆ.

## PISONIA Linn.

**Pisonia obtusata** Jacq.**Blolly**

RANGE.—Southern Florida (shores on the east coast from Cape Canaveral to the southern islands; especially large on Elliotts and Old Rhodes Key); West Indies to Brazil.

NAMES IN USE.—Pigeon wood (Fla.); Beef wood (Fla.); Cork-wood (Fla.); Pork-wood (Fla.); Blolly (Fla.).

## Family MAGNOLIACEÆ.

## MAGNOLIA Linn.

**Magnolia foetida** (Linn.) Sargent.**(Evergreen) Magnolia.****MAGNOLIA GRANDIFLORA** Linn.

RANGE.—Coast region North Carolina (south of Cape Fear River) to Florida (Mosquito Inlet and Tampa Bay) and westward in the Gulf coast region to Texas (Brazos River); through western Louisiana to southern Arkansas.

NAMES IN USE.—Magnolia (N. C., S. C., Ala., Fla., Miss., La., Tex., Ky.); Big Laurel (N. C., S. C., Miss., La.); Bull Bay (Ala., Ga., Miss.); Great Laurel Magnolia (Ala.); Laurel-leaved Magnolia; Large-flowered Evergreen Magnolia; Bat-tree; Laurel Bay; Laurel (S. C.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Magnolia foetida lanceolata** (Ait.) Sudw.**Exmouth Magnolia.****Magnolia foetida præcox** (Loud.) Sarg.**Magnolia foetida angustifolia** (Loud.) Sarg.**Magnolia foetida ferruginea** (Sims) Sudw.**Magnolia glauca** Linn.**Sweet Magnolia.**

RANGE.—Massachusetts (Gloucester, Essex County); Long Island (Turtle Pond, Suffolk County); from New Jersey to Florida (Biscayne Bay on the east coast, and to Tampa Bay on the west coast); west in the Gulf region to Texas (Trinity River).

NAMES IN USE.—Sweet Bay (Mass., R. I., Pa., N. J., N. C., S. C., Ala., Fla., Miss., La., Ark., Mo.); White Bay (N. C., S. C., Ala., Fla., Miss., La.); Swamp Laurel (Mass., N. C., Ga., Miss.); Swamp Sassafras (Del., Pa., Tenn.); Swamp Magnolia (N. J., Pa., Tenn.); Magnolia (N. J., Del., Pa.); White Laurel (Del., Miss., La.); Beaver-tree (Del., S. C., Miss.); Bay (S. C.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Magnolia glauca longifolia** Ait.**Magnolia glauca major** Sims.**Thomson Magnolia.****Magnolia acuminata** Linn.**Cucumber-tree.**

RANGE.—From western New York through southern Ontario to southern Illinois and south in the Appalachian Mountains to southern Alabama (Stockton) and north-eastern Mississippi (Meridian); central Kentucky and Tennessee (near Nashville and eastern part of State); northeastern, southern, and southwestern Arkansas.

NAMES IN USE.—Cucumber-tree (R. I., Mass., N. Y., Pa., D. C. (cult.), N. C., S. C., Ala., Miss., La., Ark., Ky., W. Va., Ohio, Ind., Ill.); Moun-



tain Magnolia (Miss., Ky.); Cucumber (W. Va.); Black Lin (W. Va.); Magnolia (Ark.); Pointed-leaved Magnolia (lit.).

**Magnolia acuminata cordata** (Michx.) Lond.

**Yellow-flowered Cucumber-tree.**

RANGE.—Occasional in the Alleghenies, but most perfect in cultivation.

NAMES IN USE.—Cucumber tree (Va., N. C., Miss., La.); Yellow-flowered Magnolia (Ala., La.); Yellow-flowered Cucumber-tree (Ala.); Yellow Cucumber-tree (Ala.); Heart-leaved Cucumber-tree (N. C.).

**Magnolia macrophylla** Michx.

**Largeleaf Umbrella.**

RANGE.—From North Carolina (southern Allegheny Mountains) to southeastern Kentucky, to middle and western Florida and southern Alabama; through northern Mississippi to Louisiana (Pearl River); central Arkansas (Garland, Montgomery, Hot Springs, and Sebastian counties).

NAMES IN USE.—Large-leaved Cucumber-tree (Ala., Miss., La.); Great-leaved Magnolia (N. C., Miss., La.); Large leaved Umbrella-tree (N. C., Tenn.); Cucumber (Ky.); Cucumber-tree (Fla.); Long-leaved Magnolia (S. C.).

**Magnolia tripetala** Linn. **Umbrella-tree.**

**MAGNOLIA UMBRELLA** Desrouss.

RANGE.—From southern Pennsylvania (throughout the Allegheny Mountains and to the coast) to central Alabama; west to central Kentucky and Tennessee and northeastern Mississippi; central and southwestern Arkansas.

NAMES IN USE.—Umbrella tree (Pa., W. Va., N. C., S. C., Ala., Miss., La.); Cucumber (Ky.); Magnolia (W. Va.); Elkwad.

**Magnolia fraseri** Walt. **Fraser Umbrella.**

RANGE.—Southwestern Virginia (mountains) to Florida (Chattahoochee River) and west through eastern Tennessee and Alabama to northern Mississippi (Pearl River).

NAMES IN USE.—Long-leaved Cucumber-tree (N. C., S. C.); Ear-leaved Umbrella-tree (N. C., S. C., Miss.); Ear-leaved Cucumber-tree (N. C., Fla.); Indian Physic (N. C., Tenn.); Indian Bitters (N. C.); Cucumber (Ky.); North Carolina Bay-tree (W. Va.); Cucumber-tree (Fla.); Water Lily-tree; Mountain Magnolia; Whahoo.

**LIRIODENDRON** Linn.

**Liriodendron tulipifera** Linn.

**Tulip-tree.**

RANGE.—From Rhode Island to southwestern Vermont and west to Lake Michigan (through southern Michigan as far north as the Grand River); south to Florida, southern Alabama, and Mississippi; west of Mississippi River in southeastern Missouri and adjacent Arkansas.

NAMES IN USE.—Tulip-tree (Vt., Mass., R. I., Conn., N. Y., N. J., Del., Pa., Va., W. Va., D. C., N. C., S. C., Ga., Ark., Ky., Ohio, Ind., Ill., Ont.); White-wood (Vt., Mass., R. I., Conn., N. Y., N. J., Del., S. C., Ky., Ohio, Ill., Mich., Ont.); Yellow Poplar (N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ala., Ark., Ky., Ohio, Ind., Mo.); Tulip Poplar (Del., Pa., S. C., Ill.); Poplar (R. I., Del., N. C., S. C., Fla., Ohio); White Poplar (Pa., Ky., Ind.); Blue Poplar (Del., W. Va.); Hickory

Poplar (Va., W. Va., N. C.); Popple (R. I.); Cucumber-tree (N. Y.); Canoe-wood (Tenn.); Old-Wife's Shirt-tree (Tenn.); Ko-yen-ta-ka-ah-ta = "White-tree" (Onandaga Indians, N. Y.); Basswood (Ohio).

VARIETIES DISTINGUISHED IN CULTIVATION.

*Liriodendron tulipifera obtusiloba* Michx.

*Liriodendron tulipifera pyramidalis* Dipp.

Pyramidal Tulip-tree.

*Liriodendron tulipifera penache* Elw. & B.

Variegated Tulip-tree.

*Liriodendron tulipifera aureo-maculata* (Arb. Kew.) Sudw.

Family ANNONACEÆ.

ASIMINA Adans.

*Asimina triloba* (Linn.) Dunal.

Papaw.

RANGE.—From western New York to the north shores of Lake Huron: from eastern and central Pennsylvania through southern Michigan, eastern Kansas; south to middle Florida and Texas (to the Sabine River).

NAMES IN USE.—Papaw (R. I., Del., N. Y., N. J., D. C., Va., W. Va., N. C., S. C., Ga., Miss., La., Ky., Ohio, Ill., Ind., Mo., Iowa, Kans., Nebr.); Custard Apple (Ont., Del., Pa., Ohio, S. C., Miss.); Banana (Ark.); False Banana (Ill.); Jasmine (La.); Jasminier (La.); Fetid Shrub (N. C.).

ANNONA Linn.

*Annona glabra* Linn.

Pond Apple.

RANGE.—Southern Florida (shores on the east coast from Biscayne Bay to Cape Malabar, and on the west coast from Pease Creek to Caloosa River); Bahama, San Domingo, St. Thomas, and St. Croix islands.

NAMES IN USE.—Pond Apple (Fla.); Custard Apple (Fla.).

Family LAURACEÆ.

PERSEA Gaertn. f.

*Persea borbonia* (Linn.) Spreng.

PERSEA CAROLINENSIS Nees.

RANGE.—Coast region from Virginia to Florida (Biscayne Bay and Cape Romano) and the Gulf region to Texas (Brazos River); northward through Louisiana to southern Arkansas.

NAMES IN USE.—Red Bay (N. C., S. C., Ga., Fla., Ala., Miss., La.); Bay Galls (Tenn.); Laurel-tree (La.); Laurier Petit Magnolia (La.); Florida Mahogany (Fla.); Sweet Bay (Fla.); False Mahogany (lit.)

*Persea pubescens* (Pursh) Sargent.

Swamp Bay.

PERSEA CAROLINENSIS var. PALUSTRIS Chapm.

RANGE.—South Atlantic and Gulf coast region from North Carolina to Mississippi.

NAMES IN USE.—Swamp Red-Bay (Fla.); Bay (Ga.).

## OCOTEA Aublet

**Ocotea catesbyana** (Michx.) Sargent.

Lancewood.

NECTANDRA WILLDENOVIANA Meisner.

RANGE.—Southern Florida (shores and islands on the east coast south of Cape Canaveral, and on the west coast south of Cape Romano).

NAMES IN USE.—Lancewood (Fla.); Sweetwood (Jamaica); Cigua (Cuba); Avispillo (Puerto Rico); Canela (Puerto Rico).

## SASSAFRAS Nees &amp; Eberm.

**Sassafras sassafras** (Linn.) Karst.

SASSAFRAS OFFICINALE Nees &amp; Eberm.

RANGE.—From eastern Massachusetts through southern Vermont, southern Ontario, and central Michigan, southeastern Iowa, eastern Kansas, and Indian Territory; south to central Florida and Texas (Brazos River).

NAMES IN USE.—Sassafras (Vt., N. H., Mass., Conn., R. I., N. Y., N. J., Pa., Del., Md., Va., W. Va., N. C., S. C., Ga., Fla., Miss., La., Tex., Ark., Ky., Mo., Ill., Ind., Kans., Nebr., Mich., Ohio, Ont.); Saxifrax (Fla.); Saxifrax-tree (Tenn.); Sassafac (W. Va.); Sassafac (Del.); Gumbo file (La., Negro dialect); Wah-eh-nah-kas = "Smelling stick" (Onondaga Indians, N. Y.).

*On old trees leaves apt not to be loved*

## UMBELLULARIA Nutt.

**Umbellularia californica** (Hook. & Arn.) Nutt. California Laurel

RANGE.—From Oregon (Rogue River) through California (coast ranges and western slopes of Sierra Nevada to southern slopes of San Bernardino Mountains).

NAMES IN USE.—California Laurel (Cal., Nev.); Mountain Laurel (Cal., Nev.); California Bay-tree (Cal., Nev.); Myrtle-tree (Oreg.); Cajeput (Oreg.); California Olive (Oreg.); Myrtle (Oreg.); Spice-tree (Nev., Oreg.); Laurel (Cal.); Bay-tree (Cal.); Oregodaphne (Cal.); Californian Sassafras.

*40.6 lb. interior finish.*

## Family CAPPARIDACEÆ.

## CAPPARIS Linn.

**Capparis jamaicensis** Jacq.

Florida Caper.

RANGE.—Southern Florida (coast from Cape Canaveral to the southern keys).

NAME IN USE.—Caper-tree (Fla.).

## Family SAXIFRAGACEÆ.

## LYONOTHAMNUS Gray.

**Lyonothamnus floribundus** Gray.

Santa Cruz Ironwood.

RANGE.—Santa Catalina and Santa Cruz islands off the southern coast of California.

Family **HAMAMELIDACEÆ.**

**HAMAMELIS** Linn.

**Hamamelis virginiana** Linn.

**Witch Hazel**

RANGE.—From Nova Scotia, New Brunswick, and valley of the St. Lawrence River to southern Ontario, Wisconsin, and eastern Nebraska; south to northern Florida and eastern Texas.

NAMES IN USE.—Witch Hazel (Me., Vt., Mass., R. I., Conn., N. Y., N. J., Del., Pa., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ky., Mo., Ill., Wis., Iowa, Ohio, Mich., Nebr.); Oe-ch-nah-kwe-ha-he = "Spotted stick" (Onondaga Indians, N. Y.); Winter Bloom, Snapping Hazel, Spotted Alder (lit. of domestic medicine).

*Chinese variety* **LIQUIDAMBAR** Linn. *Leaves 5 lobed, furnishes medicinal gum.*  
**Liquidambar styraciflua** Linn. (Red, or) **Sweet Gum.**

RANGE.—From Connecticut (Fairfield County) to southeastern Missouri and Arkansas; south to Florida (Cape Canaveral and Tampa Bay) and Texas (Trinity River).

NAMES IN USE.—Sweet Gum (Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ark., Ky., Mo., Ill., Ind., Ohio); Liquidamber (R. I., N. Y., Del., N. J., Pa., La., Tex., Ohio, Ill.); Red Gum (Va., Ala., Miss., Tex., La.); Gum (Va.); Gum-tree (S. C., La.); Alligator-wood (N. J.); Bilsted (N. J.); Star-leaved Gum; Satin Walnut (lumber markets).

Family **PLATANACEÆ.**

**PLATANUS** Linn.

**Platanus occidentalis** Linn.

**Sycamore.**

RANGE.—Southeastern New Hampshire and southern Maine to northern Vermont and Lake Ontario (Don River, near north shores of the lake); west to eastern Nebraska and Kansas, and south to northern Florida, central Alabama and Mississippi, and Texas (Brazos River and thence south to Devils River).

NAMES IN USE.—Sycamore (Vt., N. H., Mass., Conn., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ky., Ark., Mo., Ill., Ind., Iowa, Kan., Nebr., Mich., Wis., Ohio, Ont.); Button-wood (Vt., N. H., R. I., Mass., N. Y., N. J., Pa., Del., S. C., Ala., Miss., La., Tex., Ark., Mo., Ill., Nebr., Mich., Minn., Ohio, Ont.); Buttonball-tree (Mass., R. I., Conn., N. Y., N. J., Pa., Del., Miss., La., Mo., Ill., Iowa, Mich., Nebr., Ohio); Buttonball (R. I., N. Y., Pa., Fla.); Plane-tree (R. I., Del., S. C., Kans., Nebr., Iowa); Water Beech (Del.); Platane (La.); Cottonier (La.); Bois puant (La.); Oo-da-te-cha-wunnes = "Big stockings" (Indians, N. Y.).

**Platanus racemosa** Nutt.

**California Sycamore.**

RANGE.—California (from the lower Sacramento River through interior valleys and coast ranges) to Lower California (San Pedro Martir Mountain).

NAMES IN USE.—Sycamore (Cal.); Buttonwood; Buttonball-tree (Cal.); Buttonball (Cal.).

*stem & fruit divide into chads and ball*  
*falls to ground*  
**Platanus wrightii** Wats. **Arizona Sycamore.**  
 RANGE.—Southwestern New Mexico and southern Arizona; Mexico (Sonora).  
 NAMES IN USE.—Sycamore (Ariz.); Arizona Sycamore (Cal.).

## Family ROSACEAE.

### **VAUQUELINIA** Correa ex H. B. K.

**Vauquelinia californica** (Torr.) Sargent.

**Vauquelinia.**

**VAUQUELINIA TORREYI** Wats.

RANGE.—Southern Arizona (mountains; arborescent on Santa Catalina Mountains) and Mexico (Sonora) to Lower California.

### **CERCOCARPUS** H. B. K.

**Cercocarpus ledifolius** Nutt.

**Mountain Mahogany.**

RANGE.—From western Wyoming to Montana (western slopes Rocky Mountains), Idaho (Cœur d'Alene Mountains), Oregon (eastern Blue Mountains), and southward (through Wasatch Mountains and ranges of the Great Basin) to California (eastern slopes Sierra Nevada and northern slopes of San Bernardino Mountains), and to northern New Mexico and Arizona.

NAME IN USE.—Mountain Mahogany (Cal., N. Mex., Utah, Idaho, Mont.).

**Cercocarpus parvifolius** Nutt.

**Valley Mahogany.**

RANGE.—From western Nebraska to Oregon (Siskiyou Mountains), south to western Texas and northern Mexico; California (west of Sierra Nevada and south to San Jacinto mountains; Santa Cruz Islands); Lower California (mountains).

NAMES IN USE.—Mountain Mahogany (Cal., N. Mex., Utah, Idaho, Colo.); Valley Mahogany (Cal.); Feather-tree (Cal.).

**Cercocarpus parvifolius betuloides** (Nutt) Sargent.

**Birchleaf Mahogany.**

RANGE.—California (coast ranges).

**Cercocarpus parvifolius breviflorus** (Gr.) Jones.

**Short-flower Mahogany.**

RANGE.—Southern boundary of New Mexico, Arizona, and California.

**Cercocarpus parvifolius paucidentatus** Wats.

**Entireleaf Mahogany.**

RANGE.—Northern New Mexico and southern Arizona.

### **PYRUS** Linn.

**Pyrus coronaria** Linn.

**Sweet Crab.**

RANGE.—Canada (from Humber River west on shores of Lake Erie) and south through western New York and Pennsylvania to the District of Columbia, and on the Allegheny Mountains to central Alabama; west to southern Minnesota, eastern Nebraska, eastern Kansas, Indian Territory, northern Louisiana, and eastern Texas.

NAMES IN USE.—American Crab (R. I., N. J., Del., Pa., Ala., Miss., La., Ill., Ohio, Ont., Kans., Nebr., Mich., Minn.); Sweet-scented Crab (Mass., Del., Pa., N. C., S. C., Miss., Ill., Ohio, Iowa); Crab Apple (S. C., La., Ky., Mo., Ill., Ohio, Iowa, Kans., Nebr.); Wild Crab (N. Y., Ill., Ind., Wis., Iowa, Kans., Minn., Mo., Ark.); Crab (W. Va., N. C., Ga., Miss., Wis.); American Crab Apple (Nebr.); Fragrant Crab.

**Pyrus ioensis** (Wood) Bailey.**Iowa Crab.**

RANGE.—Wisconsin, Illinois, Iowa, and Kansas. Range imperfectly understood.

**Pyrus soulardi** Bailey.**Soulard Apple.**

RANGE.—Minnesota to Texas. Less common in nature than in cultivation.

**Pyrus malus** Linn.**Wild Apple.**

RANGE.—Europe. Widely naturalized in the United States and running wild in many localities.

**Pyrus angustifolia** Ait.**Narrowleaf Crab.**

RANGE.—From Pennsylvania (Allegheny County), New Jersey (Cape May County), and southern Delaware southward (in coast region) to western Florida (Chattahoochee River); west through the Gulf States to Louisiana (Red River), and north to middle (Bonair, Dickson County) and eastern Tennessee.

NAMES IN USE.—Southern Crab Apple (Del., N. C., Ala., Miss., La.); American Crab Apple (R. I., N. J., Miss.); Narrowleaf Crab (Ala.); Crab Apple (N. C., S. C., Ga.); Wild Crab Apple; Narrowleaved Crab Apple (N. C.); Narrowleaved Crab (S. C.); Crabtree (Va., Fla.).

**Pyrus rivularis** Dougl.**Oregon Crab.**

RANGE.—From the Aleutian Islands south along the coast and islands of Alaska and British Columbia through western Washington and Oregon to California (Sonoma and Plumas counties).

NAMES IN USE.—Oregon Crab Apple (Cal., Wash., Oreg.); Crab or Wild Apple.

**Pyrus americana** (Marsh.) de C.**Mountain Ash**

RANGE.—From Newfoundland to Manitoba, and south through Quebec and Ontario, Great Lake region, and high elevations in northeastern United States to eastern Tennessee, Virginia, and North Carolina.

NAMES IN USE.—Mountain Ash (Vt., N. H., Mass., R. I., N. Y., N. J., Pa., Va., W. Va., N. C., Ky., Mich., Ont.); American Mountain Ash (Pa.); Mountain Sumach (N. C., S. C.); Wine-tree (N. C.); Roundwood (Me.); Life of Man (N. Y.); Rowan-berry; "Peruve" (mts., Tenn.).

**Pyrus americana microcarpa** (Pursh) Torr. & Gr.**Smallfruit Mountain Ash.**

RANGE.—Allegheny Mountains.

**Pyrus sambucifolia** Cham. & Schl.**Elderleaf Mountain Ash.**

RANGE.—Southern Greenland to Labrador and northern New England (mountains); westward on the northern shores of the Great Lakes to Little Slave Lake, through the Rocky Mountains to Alaska (Kamchatka and northeastern Asia, Kuril Islands to Japan); south (in mountains) to New Mexico and central California (Yosemite Valley).

NAMES IN USE.—Mountain Ash (Vt., Ont.); Elder-leaved Mountain Ash.

**AMELANCHIER** Medic.**Amelanchier canadensis** (Linn.) Medic.**Serviceberry.**

RANGE.—From Newfoundland southward to northern Florida, and west along the northern shores of the Great Lakes to Minnesota, eastern Nebraska, eastern Kansas, Louisiana, and southern Arkansas.

NAMES IN USE.—June-berry (Mass., N. Y., Pa., Del., Ill., Kans., S. Dak.); Shad Bush (Mass., R. I., N. Y., Pa., Del., S. C.); Service-

berry (Del., Ill., Ark., Fla., S. Dak.); Service-tree (Pa., Del.); May Cherry (Pa., N. C.); Indian Cherry (Pa.); Wild Indian Pear (Newfoundland); Currant tree (Fla., Ala.); Shad-berly (Fla.); "Savice" (Tenn.).

**Amelanchier canadensis obovalis** (Michx.) B. S. P.

**Longleaf Service-tree.**

RANGE.—Nova Scotia, New Brunswick, Quebec, Ontario, and northwestward to the Mackenzie River (latitude 65°); south to Virginia, and west to Minnesota and Missouri; South Carolina (coast region) to Alabama (Mobile Bay).

**Amelanchier canadensis spicata** (Lam.) Sargent.

**Amelanchier alnifolia** Nutt.

**Western Serviceberry.**

RANGE.—From Alaska (Yukon River, latitude 62° 45') to California (southern boundary); eastward through British Columbia, Saskatchewan, and Manitoba to Lake Superior (western shores), northern Michigan, Nebraska, Colorado, and New Mexico (Rocky Mountains).

NAMES IN USE.—Pigeon-berly (So. Oreg.); Serviceberly; Western Serviceberly; "Sarvice" (Wyo.).

*CRATÆGUS* Linn. *Wood is used for mallets -*

**Cratægus douglasii** Lindl.

**Black Haw.**

RANGE.—From British Columbia (Parsnip River) through Washington and Oregon to California (Pitt River), and through Idaho and Montana (Flathead River at western base of Rocky Mountains).

NAMES IN USE.—Thorn Apple (Cal., Utah, Wash., Idaho, Nev.); Hawthorn (Cal.); Black Haw (Mont.); Western Haw (Oreg.); Thorn (N. Mex., Mont., Idaho); Haw (Oreg.); Black Thorn (Idaho, Utah, Wash.); Western Hawthorn (Utah); River Hawthorn (Utah); Wild Hawthorn (Utah); Thorn-tree; Wild Thorn (Oreg.).

**Cratægus brachyacantha** Sarg. & Engelm.

**Hog Haw.**

RANGE.—Northwestern Louisiana (valley of Bayou Dorchest) and western Louisiana to eastern Texas (Sabine River).

NAMES IN USE.—Hog's Haw (La.); Red Haw (La.); Pomette Bleue (La.).

**Cratægus saligna** Greene.

**Willow Haw.**

RANGE.—Lower Cimarron River, Colorado.

**Cratægus crus-galli** Linn.

**Cockspur.**

RANGE.—From the St. Lawrence River to Lake Erie (north shores) and southward to western Florida (Chipola River); westward to Missouri and Texas (Colorado River).

NAMES IN USE.—Cockspur Thorn (Vt., N. H., R. I., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Ala., Fla., Miss., Mo., Ill., Kans., Ont.); Red Haw (Tex., Ill., Mich., Miss.); Newcastle Thorn (Del., Miss.); Thorn Apple (N. Y., W. Va.); Thorn Bush (Pa.); Thorn (Pa., Ky.); Pin Thorn (W. Va.); Thorn Plum (Me.); Cockspur Hawthorn (Pa.); Hawthorn (Pa.); Haw (S. C.).

**Cratægus crus-galli salicifolia** (Medic.) Ait.

**Willowleaf Cockspur.**

**Cratægus crus-galli prunellifolia** (Poir.) Sudw.

**Broadleaf Cockspur**

**Cratægus crus-galli angustifolia** (Ehr.) Sudw.

**Narrowleaf Cockspur.**

**Cratægus crus-galli prunifolia** (Marsh.) Torr. & Gr.

**Plumleaf Cockspur.**

**Cratægus crus-galli fontanesiana** (Spach) Wenz.

**Cratægus crus-galli berberifolia** (Torr. & Gr.) Sarg.

**Barberryleaf Cockspur.**

RANGE.—South Atlantic States, and in western Louisiana and eastern Texas.

**Cratægus coccinea** Linn.

**Scarlet Haw.**

RANGE.—From Newfoundland (western shores) through Quebec and Ontario west through Winnipeg nearly to the eastern base of the Rocky Mountains; south to northern Florida, and west to eastern Texas, Nebraska, and Kansas.

NAMES IN USE.—Scarlet Haw (N. H., Mass., N. Y., N. J., Pa., N. C., S. C., Miss., Ark., Mo., Ill., Nebr., Iowa, Minn.); Red Haw (R. I., N. Y., W. Va., S. C., Ga., Miss., La., Tex., Mo., Ill., Nebr., Ohio, Iowa, Minn., S. Dak.); White Thorn (Vt., R. I., Del., Miss., Iowa, Ill., Kans., Minn., Ont.); Scarlet Thorn (Vt., Mass., R. I., N. J., Del., Ont.); Scarlet-fruited Thorn (Mich., Minn.); Red Thorn (Ky.); Hawthorn (Pa., Iowa); Thorn (Vt., N. Y., Ky., Mont.); Thorn Bush (R. I., Pa.); Thorn Apple (Vt., Mont.); Thorn Apple-tree (Minn.); Thorn Plum (Me., Vt., N. Y.); Haw Bush (Mont.); Scarlet Thorn-Haw (Fla.); Hedge Thorn (Mont.); Red Thorn Bush (Ky., Ind.).

**Cratægus macracantha** (Lindl.) Loud.

**Longspine Haw.**

RANGE.—Eastern Massachusetts, Maine (coast), northern New Hampshire and Vermont, Quebec, and west through Winnipeg, southern Michigan, Missouri, southwestern Colorado and New Mexico (Rocky Mountains), eastern Oregon and Washington (eastern slopes Cascade Mountains).

**Cratægus mollis** (Torr. & Gr.) Scheele.

**Downy Haw.**

**CRATÆGUS TOMENTOSA** var. **MOLLIS** Gray.

RANGE.—From Massachusetts (Bay) to northern New England and Quebec, and west through southern Michigan (as far north as Roscommon County) to Missouri, and through middle Tennessee to northern Alabama, and through Arkansas to Texas (San Antonio River); Mexico (Sierra Madre, near Saltillo).

NAMES IN USE.—Scarlet Haw; Red Thorn-apple (Mich.).

**Cratægus oxyacantha** Linn.

**English Hawthorn.**

RANGE.—Europe. Widely cultivated, and naturalized in a few localities in the Eastern United States.

#### VARIETIES DISTINGUISHED IN CULTIVATION.

**Cratægus oxyacantha oxyacanthoides** (Thunb.) Reich.

**Cratægus oxyacantha monogyna** (Jacq.) Lond.

**Cratægus oxyacantha laciniata** (Borkh.) de C.

**Cratægus oxyacantha diversifolia** (Poir.) Sudw.

**Cratægus oxyacantha incisa** Regel.

**Cratægus oxyacantha auriculata** Dipp.

**Cratægus oxyacantha sorbifolia** (Desf.) Dipp.

**Cratægus oxyacantha pinnatifida** (Lange.) Sudw.

**Cratægus oxyacantha ferox** Dipp.

**Cratægus oxyacantha curtispina** Sudw.



*Cratægus oxyacantha flexuosa* Lond.  
*Cratægus oxyacantha stricta* Lond.  
*Cratægus oxyacantha pendula* Lond.  
*Cratægus oxyacantha aurea* Lond.  
*Cratægus oxyacantha variegata* (Dipp.) Sudw.  
*Cratægus oxyacantha splendens* (Koch) Sudw.  
*Cratægus oxyacantha eriocarpa* Lond.  
*Cratægus oxyacantha oliveriana* (Poir.) Lond.  
*Cratægus oxyacantha aurantiaca* Lond.  
*Cratægus oxyacantha leucocarpa* Lond.  
*Cratægus oxyacantha apetala* Lond.  
*Cratægus oxyacantha præcox* Lond.  
*Cratægus oxyacantha multiplex* Lond.  
*Cratægus oxyacantha rosea* Lond.  
*Cratægus oxyacantha punicea* Lond.  
*Cratægus oxyacantha punicea plena* Sudw.  
*Cratægus oxyacantha semperflorens* Dipp.  
*Cratægus oxyacantha gratanensis* (Boiss.) Sudw.  
*Cratægus oxyacantha macrocarpa* (Hegetsch.) Sudw.

### ***Cratægus tomentosa* Linn.**

**Pear Haw.**

RANGE.—From New York (Hudson River near Troy) to eastern Pennsylvania (Chestnut Hill); west through central New York to Michigan (as far north as Roscommon County) and Missouri; Allegheny Mountains from northern Georgia to Middle Tennessee (near Nashville); through Arkansas to eastern Texas (near Dallas).

NAMES IN USE.—Black Thorn (R. I., N. J., Pa., Del., Ga., Fla., La., Miss., Ky., Ill., Ind., Ohio); Pear Haw (Miss., Ohio); Red Haw (Miss., Mo.); Pear Thorn (R. I., N. J., Mich.); White Thorn; Thorn (N. Y., Ky.); Common Thorn (Pa.); Hawthorn; Thorn-apple (Ill.); Thorn Plum.

### ***Cratægus punctata* Jacq.**

**Dotted Haw.**

**CRATÆGUS TOMENTOSA var. PUNCTATA Gray.**

RANGE.—From Quebec (Chateaugay River near Montreal) to Ontario (Detroit River); northern New Hampshire and Vermont and south through southern Michigan and western Massachusetts to Middle Tennessee, and along Appalachian Mountains to northern Georgia and Alabama.

NAME IN USE.—Dotted-fruited Thorn (lit.).

### ***Cratægus punctata canescens* Britton.**

**White Dotted Haw.**

RANGE.—Vermont (Ferrisburg).

#### VARIETY DISTINGUISHED IN CULTIVATION.

*Cratægus punctata xanthocarpa* (Melié.) Lav. **Yellowfruit Dotted Haw.**

### ***Cratægus spathulata* Michx.**

**Spatulate Haw.**

RANGE.—Coast region from southern Virginia to northern Florida and west to Arkansas (Hot Springs) and Texas (Colorado River).

### ***Cratægus cordata* (Mill.) Ait.**

**Washington Haw.**

RANGE.—From Pennsylvania (Lebanon County) and Virginia (upper Potomac River) south in Appalachian foothills region to northern Georgia; west to Middle Tennessee, Kentucky, and southern Illinois (lower Wabash River).

NAMES IN USE.—Washington Thorn (N. J., Pa., Del., N. C., S. C., Ill.); Virginia Thorn (Del.); Heart-leaved Thorn (Tenn.); Thorn (Ky.); Red Haw.

**Cratægus viridis** Linn.**Green Haw.**

RANGE.—From South Carolina (Savannah River) to western Florida (Chattahoochee River); Alabama (mountain region to coast plain), from the Mississippi River (up to near St. Louis) to Texas (Colorado River).

NAMES IN USE.—Tree Haw (Ala., Miss., La., S. C.); Red Haw (Ala., Miss., La.); Haw (Ala.); Senellier (La.); Tree Thorn (Fla.).

**Cratægus apiifolia** (Marsh.) Michx.**Parsley Haw.**

RANGE.—Coast region from southern Virginia to central Florida, and west in the Gulf region to southern Arkansas and Texas (Trinity River).

NAMES IN USE.—Parsley Haw (N. C., Ala., Fla., Miss., La.); Red Haw (Miss.); Parsley-leaved Haw (S. C.).

**Cratægus flava** Ait.**Yellow Haw.**

RANGE.—Coast region from southern Virginia (in North Carolina to western slopes of the Allegheny Mountains) to Florida (Tampa Bay); west through Alabama (mountain region to coast pine belt) and Mississippi.

NAMES IN USE.—Haw (Fla.); Yellow Haw (Fla.); Red Haw.

**Cratægus elliptica** Ait.**Downy Yellow Haw.**

RANGE.—Middle districts of North Carolina, South Carolina, and Georgia to the coast plain of Alabama.

NAME IN USE.—Summer Haw (S. C., Ga.).

**Cratægus uniflora** Muenchh.**Small-leaf Haw.**

**CRATÆGUS PARVIFOLIA** Solander in Ait.

RANGE.—From New Jersey (Delaware River) to Florida and west in the Gulf States to Louisiana and southern Arkansas.

**Cratægus æstivalis** (Walt.) Torr. & Gr.**Summer Haw.**

RANGE.—Coast region from South Carolina (Savannah River) to northern Florida and west in the Gulf States to Texas (Sabine River).

NAMES IN USE.—May Haw (Tex.); Apple Haw (Fla.); Summer Haw (Fla.).

**HETEROMELES** Roem.**Heteromeles arbutifolia** (Poir.) Roem.**Christmas-berry.**

RANGE.—Through California (coast region from Mendocino County) and islands to Lower California; inland to Sierra Nevada and San Bernardino mountains.

NAMES IN USE.—California Holly (Cal.); Christmas-berry (Cal.); Chamiso (Cal.); Toyon (Cal.); Tollen (Cal.).

**CHRYSOBALANUS** Linn.**Chrysobalanus icaco** Linn.**Cocoa Plum.**

RANGE.—Southern Florida (on the east coast from Cape Canaveral to Biscayne Bay, and on the west coast from Caximbas Bay to the southern keys); shores of West Indies, southern Mexico, and Central America; South America (northern and eastern coast to southern Brazil); Africa (west coast from Senegambia to Congo country).

NAMES IN USE.—Cocoa Plum (Fla.); Gopher Plum (Fla.).

**PRUNUS** Linn.***Prunus nigra* Ait.****Canada Plum.**

RANGE.—From Newfoundland through the St. Lawrence River valley to Manitoba (Rainy and Assiniboine rivers and Lake Manitoba). By cultivation, naturalized in parts of Michigan, northern New England, New York, and eastern Massachusetts, and may also be looked for in northern Wisconsin and Minnesota.

NAMES IN USE.—Canada Plum (Mass., N. Y., Mich., Ont.); Red Plum (Me., Vt., Ont., Mich.); Horse Plum (Me., Vt.); Wild Plum (Me., Mass., Vt., N. Y.).

***Prunus americana* Marsh.****Wild Plum.**

RANGE.—From middle and northern New Jersey and central New York to Montana (Missouri River), Nebraska, Colorado (eastern base Rocky Mountains), southern New Mexico (Rio Grande River), and south to western Florida; northeastern Mexico (mountains).

NAMES IN USE.—Wild Plum (R. I., N. J., Del., Pa., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ky., Mo., Ark., Ill., Ind., Ohio, Mich., Ont., Kans., Nebr., Iowa, Colo.); Yellow Plum (N. Y., Del., Pa., Miss., Nebr.); Red Plum (Del., Pa., N. C., Miss., La., Nebr.); Horse Plum (Miss., Ark., Colo.); Hog Plum (Colo., Mo.); August Plum (S. C.); Native Plum (Iowa); Plum (Ill.); Plum Granite; Goose Plum (Ind.); Sloe (Fla.).

***Prunus americana lanata* Sudworth.****Woollyleaf Plum.**

RANGE.—Missouri to northern Mexico.

***Prunus hortulana* Bailey.****Garden Wild Plum.**

RANGE.—Illinois (near Oquawka on Mississippi River); Missouri (near St. Louis; Maramec River); middle Tennessee (near Lebanon and Lewisburg). Range imperfectly known and may be looked for from southern Illinois and Indiana to eastern Texas.

NAMES IN USE.—Wild Goose Plum (Tenn.); Goose Plum (Tenn.).

***Prunus hortulana mineri* Bailey.****Miner Plum.**

NAME IN USE.—Goose Plum (Tenn.).

***Prunus angustifolia* Marsh.****Chickasaw Plum.****PRUNUS CHICASA Michx.**

RANGE.—Natural range uncertain. Widely naturalized from southern Delaware and Kentucky to eastern Kansas and south to central Florida and eastern Texas. Appears like a tree escaped from cultivation.

NAMES IN USE.—Chickasaw Plum (Del., W. Va., N. C., Ga., Fla., Ala., La., Tex., Miss., Ill., Kans.); Hog Plum (Miss., Tex.); Wild Red Cherry (La.); Mountain Cherry; Yellow Plum (Fla.).

***Prunus allegheniensis* Porter.****Allegheny Sloe.**

RANGE.—Central Pennsylvania (Tusseys Mountain, Huntingdon County; Bald Eagle Mountain and valley, and Alleghenies in Clearfield and Elk counties).

***Prunus subcordata* Benth.****Pacific Plum.**

RANGE.—Southern Oregon to central California (west of the Cascades and Sierra Madre mountains).

NAME IN USE.—Wild Plum.

***Prunus umbellata*<sup>1</sup> Ell.****Black Sloe.**

RANGE.—Coast region from South Carolina to Florida (Mosquito Inlet on the east coast, and on the west coast from Tampa Bay) west to eastern Mississippi; in Louisiana (Mississippi River near Baton Rouge and Red River from Alexandria to Shreveport) to southern Arkansas (near Camden).

NAMES IN USE.—Black Sloe (S. C., Ga., Ala., Miss.); Southern Bulbace Plum (S. C., Ala., Miss.); Hog Plum (Fla.); Wild Plum (Fla.); Sloe.

***Prunus emarginata* (Dougl.) Walp.****Bitter Cherry.**

RANGE.—From Montana (upper Jocko River) through the mountains of Idaho and Washington, and southern British Columbia to Vancouver Island; south through western Washington, Oregon, and northern California (on coast ranges, to near San Francisco Bay); southward in California (on western slopes Sierra Nevada to the Yosemite Valley, and on eastern slopes Sierras to Lake Tahoe and vicinity of Carson City, Nev.); also on Santa Lucia Mountains; Nevada (Washoe Mountain).

NAMES IN USE.—Wild Plum (Cal.); Bitter Cherry (Idaho, Cal.); Wild Cherry.

***Prunus emarginata villosa* Sudworth.****Woollyleaf Cherry.**

PRUNUS EMARGINATA var. MOLLIS Brewer, not Torr.

RANGE.—Southern California (San Bernardino Mountains).

***Prunus pennsylvanica* Linn. f.****Wild Red Cherry.**

RANGE.—From Newfoundland and Labrador (Strait of Bellisle) northward to Hudson Bay (near Big River), south Indian Lake, and west to British Columbia (eastern slopes coast ranges in valley Fraser River); south to Pennsylvania and along the Allegheny Mountains to western North Carolina and eastern Tennessee, to Michigan (as far south as Ionia County), northern Illinois, central Iowa; Colorado (eastern slopes of Rocky Mountains).

NAMES IN USE.—Wild Red Cherry (Me., Vt., N. H., Mass., R. I., Conn., N. Y., N. J., Pa., Va., N. C., Mich., Ont., Ill., Wis., Iowa, Minn., N. Dak.); Pin Cherry (N. H., Vt., N. Y., Mich., Iowa, N. Dak.); Pigeon Cherry (Vt., N. H., R. I., N. Y., Ont., N. Dak.); Wild Cherry (N. Y., Tenn.); Bird Cherry (Me., N. H., N. Y., Pa., Minn., Iowa); Red Cherry (Me., R. I.); Fire Cherry (N. Y.).

***Prunus cerasus* Linn.****Sour Cherry.**

RANGE.—Europe. Escaped from cultivation and running wild in various localities in eastern United States.

***Prunus mahaleb* Linn.****Mahaleb Cherry.**

RANGE.—Europe. Escaped from cultivation and running wild in southern New York and eastern Pennsylvania.

***Prunus avium* Linn.****Sweet Cherry.**

RANGE.—Europe. Escaped from cultivation and running wild in various localities in eastern United States.

***Prunus virginiana* Linn.****Choke Cherry.**

RANGE.—From Labrador and Hudson Bay region to the Mackenzie River (latitude 62°) and northern British Columbia (coast region); south to southern Georgia, Louisiana, Texas, and northern Mexico.

NAMES IN USE.—Choke Cherry (Mich., Wis.); Wild Cherry.

<sup>1</sup>Dr. J. K. Small has recently described the following new species: *Prunus injuncunda* Small, in Bull. Torr. Bot. Club, vol. 25, p. 149, 1898. Detected on Stone Mountain and Little Stone Mountain, Georgia. Said to be a tree 15 to 20 feet high, and formerly confused with *Prunus umbellata*. I have not seen specimens of this species.

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Prunus virginiana leucocarpa** Wats.  
**Prunus virginiana pendens** Sudw.  
**Prunus virginiana nana** (Du Roi) Dipp.

**White-fruit Choke Cherry.**  
**Weeping Choke Cherry.**  
**Dwarf Choke Cherry.**

**Prunus demissa** (Nutt.) Walp.**Western Choke Cherry.**

RANGE.—Rocky Mountains to the Pacific (in United States).

NAMES IN USE.—Wild Cherry (Cal., N. Mex., Utah, Idaho, Mont., Oreg.); Choke Cherry (Cal., Nev., Idaho, Utah); California Cherry (Cal.); Western Choke Cherry.

**Prunus serotina** Ehrh.**Black Cherry.**

RANGE.—From Nova Scotia westward through Canadian Provinces to the Kennebec River; south to Florida (Matanzas Inlet and Tampa Bay) and west to North Dakota (Missouri River), eastern Nebraska and Kansas, Indian Territory, and eastern Texas; western Texas (mountains).

NAMES IN USE.—Wild Black Cherry (Vt., Mass., R. I., N. Y., N. J., Del., Pa., N. C., Ala., Miss., La., Ky., Mo., Ill., Iowa, Wis., Kans., Nebr., Minn., Ohio, S. Dak. (cult.), Ont.); Wild Cherry (Conn., N. J., Pa., Del., W. Va., N. C., S. C., Ala., Fla., Tex., Ark., Ky., Ind., Ill., Iowa, Wis.); Black Cherry (Me., N. H., Vt., R. I., N. Y., Miss., Ky., Mich., Wis., Ind., Nebr.); Rum Cherry (N. H., Mass., R. I., Miss., Nebr.); Whisky Cherry (Minn.); Choke Cherry (Mo., Wis., Iowa).

**Prunus serotina neomontana** Sudworth. **Mountain Black Cherry.**

RANGE.—Southwestern Virginia ("balds" on White Top Mountain); Alabama (Talladega and Clay counties).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Prunus serotina penduliformis** Sudw.  
**Prunus serotina asplenifolia** Dipp.

**Weeping Black Cherry.**  
**Fernleaf Black Cherry.**

**Prunus salicifolia** H. B. K.**Willowleaf Cherry.**

**PRUNUS CAPULI** Cav.

RANGE.—Southern New Mexico and Arizona (mountains); Mexico (mountains); Central America (Pacific coast region); Colombia and Peru.

NAMES IN USE.—Mexican Cherry-tree; Mexican Cherry.

**Prunus caroliniana** (Mill.) Ait.**Laurel Cherry.**

RANGE.—Coast region and islands (15 to 20 miles inland) from South Carolina (Cape Fear River) to Florida (Biscayne Bay and Kissimmee River); west in the Gulf region through southern Alabama, Mississippi, Louisiana, and Texas (to Guadalupe River).

NAMES IN USE.—Wild Peach (Miss., La., Tex.); Wild Orange (N. C., S. C., Miss., Tex.); Mock Orange (N. C., S. C., Ala., Miss., La., Tex.); Laury Mundy (La.); Laurii amande (La.); Cherry Laurel (Fla.); Evergreen Cherry (Tex.); Mock Olive (Fla.); Carolinian Cherry (lit.); Laurel Cherry.

**Prunus sphærocarpa** Swartz.**West India Cherry.**

RANGE.—Florida (Biscayne Bay); West Indies; Brazil.

NAME IN USE.—West India Cherry (Fla.).

**Prunus ilicifolia** (Nutt.) Walp. **Hollyleaf Cherry.**

RANGE.—California (from San Francisco Bay through the coast ranges, also on western slopes of San Bernardino Mountains and on Santa Cruz and Santa Rosa islands) to Lower California (San Julio Canyon).

NAMES IN USE.—Spanish Wild Cherry (Cal.); Islay (Cal.); Evergreen Cherry (Cal.); Holly-leaved Cherry (Cal.); Oakleaf Cherry (Cal.); Holly Cherry (Cal.); Wild Cherry (Cal.); Holly (Cal.); Mountain Evergreen Cherry (Cal.).

**Prunus icilifolia integrifolia** Sudworth. **Entire-leaf Cherry.**

RANGE.—California (coast islands and mainland).

**Prunus persica** (Linn.) Stokes. **Peach.**

RANGE.—China. Escaped from cultivation and running wild in various localities in the United States, especially in the Middle and South Atlantic region.

## Family LEGUMINOSÆ.

### ZYGIA Browne.

**Zygia unguis-cati** (Linn.) Sudworth. **Florida Catsclaw.**

PITHECOLOBIUM UNGUIS-CATI Benth.

RANGE.—Florida (Caximbas Bay) and southern keys; West Indies to Venezuela and New Granada.

NAMES IN USE.—Cat's Claw (Fla.); Long Pod (Fla.).

**Zygia brevifolia** (Benth.) Sudworth. **Huajillo.**

PITHECOLOBIUM BREVIFOLIUM Benth.

RANGE.—Texas (Lower Rio Grande River from Rio Grande City to mouth of the river); Mexico (mouth of Rio Grande River to Sierra Madre Mountains, etc.).

**Zygia flexicaulis** (Benth.) Sudworth. **Texan Ebony.**

ACACIA FLEXICAULIS Benth.

RANGE.—Gulf coast of Texas (from Matagorda Bay) to Mexico (Sierra Madre Mountains in Nuevo Leon); Lower California (La Paz).

### LYSILOMA Benth.

**Lysiloma latisiliqua** (Linn.) Benth. **Wild Tamarind.**

RANGE.—Florida keys—Largo, Elliotts, Plantation, Boca Chica; Bahamas; West Indies.

NAME IN USE.—Wild Tamarind (Fla.).

### ACACIA Adans.

**Acacia farnesiana** (Linn.) Willd. **Huisache.**

RANGE.—Native in America (from Rio Grande River to northern Chile); Australia (northeastern and north central); Africa (subtropical); naturalized in West Indies, Guiana, Brazil, Argentina, Africa (northern and north-tropical), India, China (southern), Indian Archipelago, and islands of Pacific Ocean. Widely cultivated and naturalized from the Gulf coast region to southern California.

NAMES IN USE.—Huisache (Tex.); Cassie (Tex.).

**Acacia wrightii** Benth. **Texas Catsclaw.**

RANGE.—Western Texas (from the Guadalupe River) to Mexico (Sierra Madre Mountains in Nuevo Leon).

NAME IN USE.—Cat's Claw (Tex.).

**Acacia greggii** Gray.**Devils Claw.**

RANGE.—From Western Texas (Rio Grande River) through southern New Mexico and Arizona to southern California.

NAMES IN USE.—Cat's Claw (Tex., Cal., Ariz.); Paradise Flower (N. Mex.); Devil's Claws (Nev.); Ramshorn; Uña de Gato.

**LEUCÆNA** Hooker.**Leucæna glauca** (Linn.) Benth.**Leucæna.**

RANGE.—Western Texas (from San Saba to Devils River); Florida (Key West); Mexico; West Indies and Bahamas; South America (down to southern Brazil); tropical Africa and Asia. Native range uncertain; established mostly by cultivation.

**Leucæna pulverulenta** (Schlecht.) Benth.**Chalky Leucæna.**

RANGE.—Texas (few miles above mouth of Rio Grande River); Mexico (from Matamoras to Monterey in Nuevo Leon; Misantla River, near San Antonio; at Orizaba and Cordova, near city of Mexico).

NAME IN USE.—Mimosa.

**PROSOPIS** Linn.**Prosopis odorata** Torr. & Frem.**Screwbean.****PROSOPIS PUBESCENS** Benth.

RANGE.—Western Texas (valley of Rio Grande River, from Devils River to El Paso); west through New Mexico, Arizona, southern borders of Utah and Nevada to California (arid region of Colorado Basin to San Diego County); northern Mexico.

NAMES IN USE.—Screwbean (Tex., Utah, N. Mex., Ariz., Nev., Cal.); Screw-Pod Mesquite (Tex., Utah, Ariz., N. Mex., Nev., Cal.); Tornillo (Tex., Utah, N. Mex., Ariz., Nev.); Mescrew (Nev.); Screwbean Mesquite (Ariz.).

**Prosopis juliflora** (Swartz) de C.**Mesquite.**

RANGE.—From the southern border of Indian Territory and northern and western Texas (eastern limit defined by a line from the intersection of latitude 37° with the one hundredth meridian to Dallas; thence south to the Colorado River and south-westward within 20 or 30 miles of the Gulf, which is reached near the mouth of the Rio Grande River) into northern Mexico. Also from the southern borders of Colorado and Utah through New Mexico, Arizona, and southern Nevada to southern California (western limit defined by a line from Tejon Pass over Los Angeles to San Pedro); in Lower California; western South America (Andean region to Chile); Argentina and southern Brazil; Jamaica.

NAMES IN USE.—Mesquite (Tex., N. Mex., Ariz., Cal.); Algaroba (Tex., N. Mex., Ariz., Cal.); Honey Locust (Tex., N. Mex.); Honey Pod (Tex.); Ironwood (Tex.).

**CERCIS** Linn.**Cercis canadensis** Linn.**Redbud.**

RANGE.—From New Jersey (Delaware River) and southern Michigan (Grand and Raisin rivers) to Florida (Tampa Bay), northern Alabama (Tennessee River to Madison, Monte Sano, Cullman, Tuscaloosa) and Mississippi; west to Missouri, eastern borders of Indian Territory, Louisiana, Texas (Brazos River); Mexico (Sierra Madre in Nuevo Leon).

NAMES IN USE.—Redbud (Mass., N. Y. (cult.), N. J., Pa., Del., D. C., Va., W. Va., N. C., S. C., Ala., Fla., Ark., Miss., La., Tex., Mo., Ill., Ind.,

Mich. (cult.); Judas-tree (Mass., R. I., N. Y. (cult.), N. J., Del., Pa., D. C., Va., N. C., S. C., Miss., La., Tex., Ky., Ill., Ind., Ohio., Mich., Minn. (cult.); Red Judas-tree; Salad-tree (Del.): Canadian Judas tree (lit.).

**Cercis canadensis pubescens** Pursh.

**Downy Redbud.**

RANGE.—Type locality, "Georgia;" westward.

VARIETY DISTINGUISHED IN CULTIVATION.

**Cercis canadensis plena** Sudw.

**Double-flower Redbud.**

**Cercis reniformis** Engelm.

**Texas Redbud.**

RANGE.—Eastern Texas (from near Dallas) to Mexico (Sierra Madre in Nuevo Leon).

NAMES IN USE.—Redbud (Tex.); Texas Redbud.

**GLEDITSIA** Linn.

*Bipinnate leaves.*

**Gleditsia triacanthos** Linn.

**Honey Locust.**

RANGE.—From Pennsylvania (western slopes Allegheny Mountains) west through southern Ontario (Pelee Island, Lake Erie), southern Michigan (up to River Raisin) to eastern Nebraska and Kansas, Indian Territory (to longitude 96°); south to Georgia and through Alabama, Mississippi, and Texas (to Brazos River). Range more or less extended elsewhere by seeding from cultivated trees.

NAMES IN USE.—Honey Locust (Vt., N. H., Mass., R. I., N. Y., N. J., Pa., Del., D. C., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ark., Ky., Mo., Ohio, Ill., Ind., Kans., Nebr., Mich., Iowa); Black Locust (Miss., Tex., Ark., Kans., Nebr.); Sweet Locust (S. C., La., Kans., Nebr.); Three-thorned Acacia (Mass., R. I., La., Tex., Nebr., Mich., Ont.); Thorn Locust (N. Y., Ind., La.); Thorntree (N. Y., Ind., La.); Thorny Locust (N. J.); Locust (Nebr.); Honey (R. I., N. J., Iowa); Honey Shucks (R. I., N. J., Va., Fla., Iowa); Thorny Acacia (Tenn.); Honey-Shucks Locust (Ky.); Piquant Amonrette (La.); Confederate Pintree (Fla.).

**Gleditsia triacanthos laevis** (Loud.) Sudworth.

**Thornless Honey Locust.**

**GLEDITSIA TRIACANTHOS. var. INERMIS** Willd.

**Gleditsia triacanthos brachycarpus** Michx.

**Short-pod Honey Locust.**

VARIETY DISTINGUISHED IN CULTIVATION.

**Gleditsia triacanthos bujotii** (Nenm.) nom. nov.

**Bujot Locust**

**GLEDITSIA BUJOTII** Neumann.

**Gleditsia aquatica** Marsh.

**Water Locust.**

**GLEDITSIA MONOSPERMA** Walt.

RANGE.—Coast region, from South Carolina to Florida (Matanzas Inlet and Tampa Bay), from which it extends along the Gulf coast to Texas (Brazos River); northward through western Louisiana and southern Arkansas, southern Missouri, middle and west Tennessee and Kentucky, southern Illinois, and Indiana.

NAME IN USE.—Water Locust (Fla., La., Tex., Mo., Ind., Ill.).



81  
*Bark ridged & thorny*  
**GYMNOCLADUS** Lam.

**Gymnocladus dioicus** (Linn.) Koch.

*Kentucky Coffeetree.*

**GYMNOCLADUS CANADENSIS** Lam.

**RANGE.**—New York (Cayuga and Seneca lakes); Pennsylvania (Conococheague Creek, Franklin County), and west through southern Ontario (Pelee Island, Lake Erie), southern Michigan (Maple River, in Clinton County; Fish Creek, in Montcalm County; Grand River), to Minnesota (Minnesota River), eastern Nebraska, eastern Kansas, southwestern Arkansas, Indian Territory (longitude 96°); southward, mainly between the Mississippi River and Allegheny Mountains, to Tennessee (upper eastern section and middle section, near Nashville). Range somewhat extended elsewhere by seeding from cultivated trees.

**NAMES IN USE.**—Kentucky Coffeetree (Mass., R. I. (cult.), N. Y., Pa. (cult.), Del., Va., W. Va., N. C., Miss., Ark., Mo., Ill., Kans., Ont., Mich., Iowa); Coffeenut (Ky., Mo., Ill., Ind., Nebr.); Coffeetree (W. Va., Ark., Ky., Nebr.); Coffeebean (Ill., Kans., Nebr.); Coffeebean-tree (Ky., Ark.); Mahogany (N. Y.); Virgilia (Tenn.); Nickertree (Tenn.); Stumptree (Tenn.).

**PARKINSONIA** Linn.

**Parkinsonia aculeata** Linn.

**Horse-bean.**

**RANGE.**—Texas (lower Rio Grande River); Arizona and California (in valley of Colorado River); northern Mexico and Lower California.

**NAMES IN USE.**—Horse-bean; Retama (Tex.).

**Parkinsonia microphylla** Torr.

**Small-leaf Horse-bean.**

**RANGE.**—Southern Arizona (desert region); southern California (desert region adjoining Arizona); Lower California (adjoining California); Mexico (Sonora).

**NAMES IN USE.**—Desert Bush; Jerusalem Thorn; Palo Verde (Cal.).

**CERCIDIUM** Tulasne.

**Cercidium floridum** Benth.

**Greenbark Acacia.**

**RANGE.**—Western Texas (Matagorda Bay to Hidalgo County) to Mexico (mouth of Rio Grande River to foothills of Sierra Madre; also near Monterey).

**NAMES IN USE.**—Green-barked Acacia (Ariz.); Palo Verde (Tex., Ariz., N. Mex.); Acacia.

**Cercidium torreyanum** (Wats.) Sargent.

**Palo Verde.**

**PARKINSONIA TORREYANA** Wats.

**RANGE.**—Southern California (Colorado Desert) and Arizona (lower Gila River Valley) and south into Mexico (Sonora) and Lower California.

**NAMES IN USE.**—Green barked Acacia; Palo Verde.

**SOPHORA** Linn.

**Sophora secundiflora** (Cav.) de C.

**Frijolito.**

**RANGE.**—Southern Texas (Matagorda Bay) to New Mexico (mountain canyons) and southward into Mexico (mountain canyons of Nuevo Leon and San Luis Potosi).

**NAMES IN USE.**—Coral Bean; Frijolito (Tex.).

**Sophora affinis** Torr. & Gr.

**Sophora.**

**RANGE.**—Arkansas (from Arkansas River) to Texas (San Antonio River and westward to the upper Colorado River).

**NAMES IN USE.**—Pink Locust (Tex.); Beaded Locust (Tex.).

*Commonly cultivated*

**CLADRASTIS Raf.****Cladrastis lutea** (Michx. f.) Koch.**Yellow-wood.****CLADRASTIS TINCTORIA Raf.**

RANGE.—Central Kentucky (Kentucky and Dick rivers); middle Tennessee (near Nashville) and eastern Tennessee (Great Smoky Mountains in Cocke and Sevier counties); North Carolina (Cherokee County); Alabama (Tennessee River Valley, near Colbert, Sheffield Landing).

NAMES IN USE.—Yellow-wood (Tenn., N. C.); Yellow Locust (Ky., Tenn.); Yellow Ash; Gopherwood (Tenn.)

**EYSENHARDTIA H. B. K.****Eysenhardtia orthocarpa** (Gray) Wats.**Eysenhardtia.**

RANGE.—From western Texas (upper Guadalupe River) to southern Arizona (Santa Catalina and Santa Rita mountains) and south into Mexico (to southwestern Chihuahua and to near San Luis Potosi).

**DALEA Willd.****Dalea spinosa** Gray.**Indigo Thorn.**

RANGE.—Southern California (Colorado Desert—at Agua Caliente and Toros) and eastward into Arizona (to lower Gila River); south into adjacent Mexico (Sonora) and Lower California (to Calamujnet).

NAMES IN USE.—Dalea (Cal.); Indigo Bush (Cal.).

**ROBINIA Linn.****Robinia pseudacacia** Linn.**Locust.**

RANGE.—From Pennsylvania (on the Appalachian Mountains from Locust Ridge in Marion County) to northern Georgia. Widely naturalized through cultivation and other agencies throughout the United States east of the Rocky Mountains; possibly indigenous in parts of Arkansas (Crowleys Ridge, etc.) and eastern Indian Territory; also in the Great Smoky Mountains of eastern Tennessee (Sevier County).

NAMES IN USE.—Locust (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Ga., Ala., Miss., Tex., Ky., Ark., Ariz., Ill., Wis., Ohio, Ind., Kans., Nebr., Mich., Iowa, Minn.); Black Locust (Pa., Va., W. Va., N. C., S. C., Ala., Miss., La., Tex., Ark., Ky., Mo., Ill., Ohio, Ind., Iowa, Kans., Nebr., Mich., Minn.); Yellow Locust (Vt., Mass., N. Y., Pa., Del., Va., W. Va., Miss., La., Ill., Ind., Kans., Nebr., Minn.); White Locust (R. I., N. Y., Tenn.); Red Locust (Tenn.); Green Locust (Tenn.); Acacia (La.); False Acacia (S. C., Ala., Tex., Minn.); Honey Locust (Minn.); Bastard Acacia (Ilt.); Pea-flower Locust; Post Locust (Md.).

**VARIETIES DISTINGUISHED IN CULTIVATION.****Robinia pseudacacia decaisneana** Carr.**Pink Locust.****Robinia pseudacacia crispa** de C.**Crinkleleaf Locust.****Robinia pseudacacia amplifolia** Sudw.**Broadleaf Locust.****Robinia pseudacacia angustifolia** (Loud.) Lav.**Smallleaf Locust.****Robinia pseudacacia monophylla** Petz. & Kirchn.**Simpleleaf Locust.****Robinia pseudacacia tortuosa** (Hollm.) de C.**Twistbranch Locust.**

*Eucalyptus - a layer is 21 months in*

<i>Robinia pseudacacia pyramidalis</i> Petz. & Kirchn.	Pyramid Locust.
<i>Robinia pseudacacia pendula</i> (Ortega) Lond.	Weeping Locust.
<i>Robinia pseudacacia inermis</i> (Jacq.) Sudw.	Parasol Locust.
<i>Robinia pseudacacia spectabilis</i> (Du Mont Cour.) Koch.	Thornless Locust.
<i>Robinia pseudacacia latisiliqua</i> Lond.	Broadpod Locust.
<i>Robinia pseudacacia dissecta</i> (Koch) Sarg.	Cutleaf Locust.
<i>Robinia pseudacacia glaucescens</i> Koch.	Blue Locust.
<i>Robinia pseudacacia aurea</i> (Koch) Dipp.	Goldenleaf Locust.
<i>Robinia pseudacacia purpurea</i> Dipp.	Purpleleaf Locust.
<i>Robinia pseudacacia argenteo-variegata</i> (Koch) Sudw.	Spotted Locust.

**Robinia neo-mexicana** Gray.**New-Mexican Locust.**

RANGE.—Colorado (from Purgatory River) through northern New Mexico and Arizona (to Santa Catalina and Santa Rita mountains) and to southern Utah (near Kanab and in Mount Zion Canyon, west fork of Rio Virgen River).

NAME IN USE.—Locust (Ariz., N. Mex.).

**Robinia viscosa** Vent.**Clammy Locust.**

RANGE.—Mountains of North Carolina. Widely naturalized by cultivation east of the Mississippi River.

NAMES IN USE.—Clammy Locust (Mass., R. I., N. Y., N. J., Pa., N. C., S. C., La., Miss., Ill.); Honey Locust (N. Y., N. J.); Red-flowering Locust (Ala.); Rose-flowering Locust (Tenn.); Rose Acacia (Vt., R. I., Pa.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

<i>Robinia viscosa albiflora</i> Dipp.	White-flower Clammy Locust.
<i>Robinia dubia</i> Foug.	
<i>Robinia bella-rosea</i> Nichol.	

**OLNEYA** Gray.**Olneya tesota** Gray.**Sonora Ironwood.**

RANGE.—Southern California (from Colorado River south of Mohave Mountains) to southwestern Arizona and through adjacent Mexico (Sonora) and Lower California (between Comundee and Calamujnet).

NAMES IN USE.—Iron Wood (Cal.); Arbol de Hierro (Cal.); Palo de Hierro (Ariz.).

**ICHTHYOMETHIA** Browne.**Ichthyomethia piscipula** (Linn.) Kuntze.**Jamaica Dogwood.****PISCIDIA ERYTHRINA** Linn.

RANGE.—Southern Florida (Biscayne Bay on east coast, and on the west from Pease Creek to Cape Sable) and southern keys; West Indies and southern Mexico.

NAME IN USE.—Jamaica Dogwood (Fla.).

Family **ZYGOPHYLLACEÆ.****GUAJACUM** Linn.**Guajacum sanctum** Linn.**Lignum-vitæ.**

RANGE.—Florida keys from Key West eastward (upper and lower Metacombe keys, Lignum vitæ Keys, Umbrella Keys); Bahamas, San Domingo, and Puerto Rico.

NAMES IN USE.—Lignum-vitæ (Fla.); Ironwood (Fla.).

## Family RUTACEÆ.

**XANTHOXYLUM** Linn.**Xanthoxylum clava-herculis** Linn.**Prickly Ash.**

RANGE.—Coast region from southern Virginia to Florida (Biscayne Bay and Tampa Bay); west through the Gulf States to northwestern Louisiana, southern Arkansas, and through Texas (to Devils River).

NAMES IN USE.—Prickly Ash (N. C., S. C., Ga., Fla., Miss., La., Tex., Ark.); Toothache-tree (N. C., S. C., Fla., Miss., La., Ark.); Pepper-wood (Miss.); Sea Ash (Miss., Fla.); Southern Prickly Ash (Ala.); Ash (Va.); Frêne-piquant (La.); Sting-tongue (Fla. Negroes, Ark.); Wait-a-bit, Tear-blanket (Ark.); Wild Orange.

**Xanthoxylum clava-herculis fruticosum** Gray.**Xanthoxylum cribrorum** Spreng.**Satinwood.**

RANGE.—Florida keys (Marquesas Keys, South Bahia Honda, and Boca Chica Keys); San Domingo, Puerto Rico, Bahamas, and Bermuda.

NAMES IN USE.—Yellow-wood (Fla.); Satinwood (Fla.).

**Xanthoxylum fagara** (Linn.) Sargent.**Wild Lime.**

**XANTHOXYLUM PTEROTA** H. B. K.

RANGE.—Southern Florida coast and islands (on the east coast south of Mosquito Inlet and on the west coast south of latitude 29°); coast of Texas (from Matagorda Bay to the Rio Grande River); West Indies; northern Mexico; Central and South America (to Brazil and Peru).

NAME IN USE.—Wild Lime (Fla.).

**PTELEA** Linn.**Ptelea trifoliata** Linn.**Hoptree.**

RANGE.—Southern Ontario (Point Pelee, Lake Ontario); New York (Long Island); Pennsylvania and west through southern Michigan (up to Montcalm County) to Minnesota; south to northern Florida and west to Texas, and through New Mexico to Colorado (Mimbres River); northern Mexico.

NAMES IN USE.—Hoptree; Wafer Ash; Whahoo; Quinine-tree (Mich.).

VARIETY DISTINGUISHED IN CULTIVATION.

**Ptelea trifoliata aurea** Nich.

**Golden Hoptree.**

**HELIETTA** Tulasne.**Helietta parvifolia** Benth.**Baretta.**

RANGE.—Texas (near Rio Grande City); Mexico (south of the lower Rio Grande to the lower slopes of the Sierra Madre Mountains and through Nuevo Leon).

**AMYRIS** Browne.**Amyris maritima** Jacq.**Torchwood.**

**AMYRIS SYLVATICA** de C.

RANGE.—Southern Florida (from Mosquito Inlet on the east coast to the southern keys); Bahamas, St. Thomas, Cuba, and Jamaica Islands.

NAME IN USE.—Torchwood (Fla.).

**CANOTIA Torr.****Canotia holacantha Torr.****Canotia.**

RANGE.—Arizona (from White Mountain region to the Bill Williams (River) Fork); southern California (Providence Mountains).

NAME IN USE.—Canotia (Ariz.).

**Family SIMAROUBACEÆ.****SIMAROUBA Aublet.****Simarouba glauca de C.****Paradise-tree.**

RANGE.—Southern Florida (from Cape Canaveral, on the west coast, to the southern keys and to Biscayne Bay); Cuba, Jamaica, Nicaragua, and Brazil.

NAMES IN USE.—Paradise-tree (Fla.); Gumbo Limbo (Fla.); Bitterwood (Fla.).

**KOEBERLINIA Zucc.****Koeberlinia spinosa Zucc.****Koeberlinia.**

RANGE.—Texas (from valley of Rio Grande River southward) to northern Mexico (to near Altar River, in Sonora, and to near San Luis Potosi).

**AILANTHUS Desf.****Ailanthus glandulosa Desf.**

*grows very fast*  
*Ailanthus*  
*straight twigs*

RANGE.—China; but widely naturalized in Eastern United States.

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Ailanthus glandulosa rubra Dipp.****Redfruit Ailanthus.****Ailanthus glandulosa pendulifolia Dipp.****Drooping Ailanthus.****Ailanthus glandulosa aucubæfolia Dipp.****Family BURSERACEÆ.****BURSERA Jacq.****Bursera simaruba (Linn.) Sargent.****Gumbo Limbo.****BURSERA GUMMIFERA Linn.**

RANGE.—Southern Florida (on the east coast from Cape Canaveral to the southern keys; west coast on Caloosa River and Caximbas Bay); West Indies, southern Mexico, Guatemala, New Grenada, Venezuela.

NAMES IN USE.—Gum Elemi (Fla.); Gumbo Limbo (Fla.); West Indian Birch (Fla.).

**Family MELIACEÆ.****MELIA Linn.**

*Mahogany*  
*something like*  
*Ailanthus.*  
*China-tree.*

**Melia azedarach Linn.**

RANGE.—Persia. Widely cultivated in Old and New World and naturalized by cultivation in Southern United States.

**Melia azedarach umbraculifera Sargent.****Umbrella China-tree.**

**SWIETENIA** Jacq.**Swietenia mahagoni** Jacq.**Mahogany.**

RANGE.—Florida keys (Key Largo and Elliotts Key); Bahamas, West Indies, southern Mexico, Central America, and Peru.

NAMES IN USE.—Mahogany (Fla.); Madeira (Fla.); Redwood (Fla.).

Family **EUPHORBIACEÆ.****DRYPETES** Vahl.**Drypetes lateriflora** (Swartz) Urban.**Florida Plum.****DRYPETES CROCEA** Poit.

RANGE.—Southern Florida (Biscayne Bay) and several of the southern keys; Bahamas, Cuba, San Domingo, Jamaica, Puerto Rico.

NAMES IN USE.—Guiana Plum (Fla.); Whitewood (Fla.).

**Drypetes keyensis** Urban.**Guiana Plum.**

RANGE.—Florida keys (Key West, Umbrella Key, Elliotts Key).

NAMES IN USE.—Guiana Plum (Fla.); Whitewood (Fla.).

**GYMNANTHES** Swartz.**Gymnanthes lucida** Swartz.**Crabwood.****SEBASTIANA LUCIDA** Muell.

RANGE.—Coast of southern Florida (from Biscayne Bay to the Marquesas Keys); Bahamas, West Indies.

NAMES IN USE.—Crabwood (Fla.); Poisonwood (Fla.).

**HIPPOMANE** Linn.**Hippomane mancinella** Linn.**Manchineel.**

RANGE.—From the keys of southern Florida through the Bahamas and West Indies to northern South America and eastern and western coast of Central America and southern Mexico.

NAME IN USE.—Manchineel (Fla.).

**SAPIUM** Browne.**Sapium sebiferum** Roxb.**Tallow-tree.****STILLINGIA SEBIFERUM** Michx.

RANGE.—China and Japan. Cultivated and naturalized in the Gulf States.

Family **CHEIRANTHODENREÆ.****FREMONTODENDRON** Coville.**Fremontodendron californicum** (Torr.) Coville.**Fremontia.****FREMONTIA CALIFORNICA** Torr.

RANGE.—California (from Mariposa) to Lower California.

NAMES IN USE.—Slippery Elm (Cal.); Silver Oak (Cal.); Leatherwood (Cal.); Fremontia (Cal.).

## Family THEACEÆ.

*Handsome in gardens. Original came from*  
**Gordonia lasianthus** (Linn.) Ellis. **Loblolly Bay.**

RANGE.—Coast region from southern part of Virginia to Florida (Cape Malabar and Cape Romano) and west in the Gulf region to the Mississippi River.

NAMES IN USE.—Loblolly Bay (N. C., S. C., Ga., Ala., Fla., Miss., La.); Tan Bay (Miss., Fla., La.); Black Laurel (N. C.).

**Gordonia altamaha** (Marsh.) Sargent.

**Franklinia.**

**GORDONIA PUBESCENS** L'Her.

RANGE.—At present known only in cultivation. Originally (1765) found growing wild in Georgia (near Fort Barrington on the Altamaha River), but not seen since 1790.

## Family CANELLACEÆ.

**CANELLA** Browne.

**Canella winterana** (Linn.) Garth.

**Cinnamon-bark.**

**CANELL ALBA** Murr. in Linn.

RANGE.—Florida keys

NAMES IN USE.—Cinnamon-bark (Fla.); Whitewood; Wild Cinnamon.

## Family ANACARDIACEÆ.

**COTINUS** Adams.

**Cotinus cotinoides** (Nutt.) Britton.

**American Smoke-tree.**

**RHUS COTINOIDES** Nutt.

RANGE.—Indian Territory (Grand River); Alabama (north of Tennessee River and on southern slopes of Cumberland Mountains near Huntsville); eastern Tennessee (Cheat Mountain); Texas (Medina River).

NAMES IN USE.—Chittamwood (Ala.); Yellow-wood (Ala.); Smoke-tree (Ark.). In (cult.).

*Death has resulted from coming in connection with smoke of burning poison*  
**Rhus metopium** Linn. **Poisonwood.**

RANGE.—Southern Florida (Biscayne Bay) and southern keys: Bahamas, Cuba, Jamaica, Honduras.

NAMES IN USE.—Poisonwood (Fla.); Coral Sumach; Mountain Maychineseel; Bumwood; Hog Plum; Doctor Gum.

**Rhus hirta** (Linn.) Sudworth.

**Staghorn Sumach.**

**RHUS TYPHINA** Linn.

RANGE.—From New Brunswick (through the St. Lawrence River Valley) to southern Ontario and Minnesota; south through the Northern States and along the Allegheny Mountains to northern Georgia, central Alabama, and Mississippi.

NAMES IN USE.—Staghorn Sumach (Vt., N. H., Mass., R. I., Conn., N. Y., N. J., Del., Pa., N. C., S. C., Miss., Mo., Mich., Wis., Ohio, Ont.); Sumach (Me., Vt., N. Y., Pa., W. Va., Ark., Ky., Ind., Wis.); Virginia Sumach (Tenn.); Hairy Sumach.

*Red berries not apt to be poisonous*

**Rhus copallina** Linn.**Dwarf Sumach.**

RANGE.—New England to Florida (Manatee and Caximbas Bay), and west to Missouri, Arkansas, and Texas (San Antonio River); Cuba.

NAMES IN USE.—Dwarf Sumach (Vt., N. H., R. I., Mass., N. Y., Del., Pa., Ala., Fla., Miss., La., Kans.); Sumach (Vt., Pa., W. Va., S. C., Fla., Ga., Miss., La., Tex., Ky., Mo., Kans.); Smooth Sumach; Mountain Sumach (Vt., Tenn.); Black Sumach (Ark., Tex.); Wing-rib Mountain Sumach (S. C.); Common Sumach (S. C.).

**Rhus copallina leucantha** (Jacq.) de C.**White-flowered Dwarf Sumach.**

RANGE.—Texas (near New Braunfels).

**Rhus copallina lanceolata** Gray.**Lanceleaf Dwarf Sumach.**

RANGE.—Eastern Texas (to Rio Grande River).

**Rhus vernix** Linn.**Poison Sumach.**

RHUS VENENATA de C.

RANGE.—Northern New England to northern Georgia and Alabama; west to northern Minnesota, Arkansas, and western Louisiana.

NAMES IN USE.—Poison Sumach (Vt., N. H., Mass., R. I., Conn., N. Y., N. J., Del., N. C., S. C., Ala., Miss., La., Mo., Iowa, Wis., Mich., Minn., Ohio, Ont., Nebr.); Poison Elder (Vt., Mass., R. I., N. Y., Del., S. C., Ga., Ala., Miss., La., Mo., Nebr., Minn.); Poison Dogwood (N. H., Vt., N. J., Pa., D. C., Mo., Mich., Minn.); Dogwood (Vt., Mass., R. I., Wis., Mich., Iowa, Nebr., Minn., La.); Swamp Sumach (R. I., N. Y., N. J., Tenn., Minn.); Sumach (R. I.); Poison Oak (La.); Poison Ash (Pa.); Poisonwood (Tenn.); Poisontree; Thunderwood (Ga.).

**Rhus integrifolia** (Nutt.) Benth. & Hook.**Western Sumach.**

RANGE.—Coast of southern California (from Santa Barbara) to southern Lower California (Magdalena Bay); Santa Barbara and Cedros Islands.

**Family CYRILLACEÆ.****CYRILLA** Linn.**Cyrilla racemiflora** Linn.**Ironwood.**

RANGE.—Coast region from North Carolina to Florida (to latitude 30° and on southern keys); inland in South Carolina and Georgia to near Augusta; west on Gulf coast to Texas (Neches River); Cuba, Jamaica, Dominica, Demerara, and Brazil.

NAMES IN USE.—Ironwood (S. C., Ga., Fla., Miss., La.); Leatherwood (Ala., Fla.); He Huckleberry (S. C.); Burnwood; Burnwood-bark; Firewood (Ga.); Burning-wood (Ga.); Red Titi (Fla.); White Titi.

**CLIFTONIA** Gärtn. f.**Cliftonia monophylla** (Lam.) Sargent.**Titi.**

CLIFTONIA LIGUSTRINA Sims ex Spreng.

RANGE.—Coast region from South Carolina (Savannah River) to northern Florida, and west in the Gulf region to eastern Louisiana.

NAMES IN USE.—Titi (S. C., Ga., Ala., Fla., Miss.); Buckwheat-tree (Fla., La.); Black Titi (Fla.); Ironwood.



not all species of *Ilex* evergreen  
or have spring leaves.

## Family AQUIFOLIACEÆ.

### ILEX Linn.

#### **Ilex opaca** Ait.

**American Holly.**

RANGE.—Coast region from Massachusetts (Massachusetts Bay, near Quincy) to Florida (Mosquito Inlet and Charlotte Harbor); from southern Indiana (through Mississippi River Valley) to the Gulf, and through Missouri, Arkansas, Louisiana, and eastern Texas.

NAMES IN USE.—Holly (R. I., Del., W. Va., Pa., N. C., S. C., Ga., Fla., Miss., La., Ark.); American Holly (Mass., R. I., Conn., N. Y., N. J., Pa., Del., N. C., Ala., Miss., La.); White Holly (Va.).

#### **Ilex cassine** Linn.

**Dahoon (Holly).**

ILEX DAHOON Walt.

RANGE.—Coast region from southern Virginia to Florida (Biscayne Bay and Tampa Bay); west on the Gulf coast to western Louisiana.

#### **Ilex cassine angustifolia** Willd.

**Narrowleaf Dahoon.**

#### **Ilex cassine mytifolia** (Walt.) Sargent.

**Myrtle-leaf Dahoon.**

RANGE.—North Carolina to Louisiana.

NAMES IN USE.—Dahoon (N. C., S. C., Ga., Ala., Fla., Miss., La.); Dahoon Holly (N. C., S. C., Fla.); Yaupon (Fla.).

#### **Ilex vomitoria** Ait.

**Yaupon (Holly).**

ILEX CASSINE Walt.

RANGE.—Coast region from southern Virginia to Florida (St. Johns River and Cedar Keys); west on the Gulf coast to southern Texas (Matagorda Bay) and to western Texas (Rio Blanco River), and west of the Mississippi River northward to southern Arkansas.

NAMES IN USE.—Yopon (N. C., Ga., Ala., Miss., Tex.); Yaupon (N. C., S. C., Fla., Miss., La.); Cassena (N. C., S. C., Fla., La.); Cassine (La.); True Cassena; Evergreen Cassena; Cassio-berry Bush; Emetic Holly (S. C.).

#### **Ilex decidua** Walt.

**Deciduous Holly.**

RANGE.—From southern Virginia (ranging from the coast to the eastern base of the Appalachian Mountains) to western Florida; from southern Illinois to the Gulf and through southwestern Missouri, Arkansas, and eastern Texas (Colorado River).

NAMES IN USE.—Holly (Tex., Ark., Mo.); Bearberry (Miss.); Possum Haw (Fla.).

#### **Ilex monticola** Gray.

**Mountain Holly.**

RANGE.—From New York (Catskill Mountains and Cattaraugus County) southward in the mountains (and in Pennsylvania as far east as Northampton County) to northern Alabama. Arborescent chiefly in the mountains of North Carolina, South Carolina, and eastern Tennessee (Great Smoky Mountains).

## Family CELASTRACEÆ.

### EVONYMUS Linn.

#### **Evonymus atropurpureus** Jacq.

**Wahoo.**

RANGE.—From western New York through Michigan to Nebraska (and in Montana on upper Missouri River); south to northern Florida, southern Arkansas, and Indian Territory.

NAMES IN USE.—Burning Bush (R. I., N. Y., N. J., Pa., Del., Md., N. C., S. C., Miss., Ark., Ky., Ohio, Ill., Ind., Iowa, Kans., Nebr.,

Mich.); Waahoo (N. Y., N. J., Pa., W. Va., N. C., S. C., Miss., Ky., Ark., Mo., Nebr., Ill., Iowa, Kans., Ohio, Ind.); Spindle-tree (R. I., Del., Pa., N. C., Ill.); Arrow-wood (Miss., La., Ill., Mo.); Strawberry-tree (N. Y.); Strawberry Bush (Tenn.); "Moses in the Burning Bush" (N. J.); Bleeding Heart (N. C.); Indian Arrow (Ind.).

### GYMINDA Sargent.

**Gyminda grisebachii** Sargent.

**Gyminda.**

MYGINDA PALLENS Smith ex Sargent.

RANGE.—Islands of southern Florida (from Marquesas to Upper Metacombe Key); Cuba, and Puerto Rico.

NAMES IN USE.—False Boxwood (Fla.); Gyminda.

**Gyminda grisebachii glaucifolia** (Griseb.) Sudworth.

**Pale Gyminda.**

RANGE.—Cuba.

### SCHÆFFERIA Jacq.

**Schæfferia frutescens** Jacq.

**Florida Boxwood.**

RANGE.—Islands of southern Florida (vicinity Caloos River, and from Metacombe Key eastward, and on Reef Keys); Bahamas, West Indies, Venezuela.

NAMES IN USE.—Yellow-wood (Fla.); Boxwood (Fla.).

## Family ACERACEÆ.

### ACER Linn.

**Acer spicatum** Lam.

**Mountain Maple.**

RANGE.—From the lower St. Lawrence River to northern Minnesota and region of the Saskatchewan River; south through the Northern states (in Michigan down to Eaton County) and along the Appalachian Mountains to northern Georgia.

NAMES IN USE.—Mountain Maple (Vt., N. H., R. I., Conn., N. Y., N. J., Pa., N. C., S. C., Mich., Minn.); Moose Maple (Vt.); Low Maple (Tenn.); Water Maple (Ky.).

**Acer pennsylvanicum** Linn.

**Striped Maple.**

RANGE.—From Quebec (Ha-Ha Bay, on Saguenay River) westward along the shores of Lake Ontario and islands of Lake Huron to northeastern Minnesota; southward into the Northern and North Atlantic States (in Michigan to Roscommon County) and along the Appalachian Mountains to northern Georgia.

NAMES IN USE.—Striped Maple (Vt., N. H., R. I., Mass., N. Y., Pa., N. J., S. C., Ga., Ky., Mich., Minn., Ont.); Moosewood (Me., Vt., N. H., R. I., Mass., N. Y., Pa., N. C., Mich., Minn.); Northern Maple (Minn.); Striped Dogwood (N. Y., N. C.); Mountain Alder (N. C.); Whistlewood (Mich.); Goosefoot Maple.

**Acer macrophyllum** Pursh.

**Oregon Maple.**

RANGE.—From the coast region of Alaska (south of latitude 55°), British Columbia, and islands southward through Washington and Oregon (west of the Cascade Mountains) and California (coast ranges and western slopes of Sierra Nevada Mountains to San Bernardino Mountains and Hot Spring Valley in San Diego County).

NAMES IN USE.—Bigleaf Maple (Oreg.), Broad-leaved Maple (central Cal.; Oreg., Willamette Valley); Oregon Maple (Oreg., Wash.); White Maple (Oreg., Wash.); Maple (Cal.).

**Acer circinatum** Pursh.

Vine Maple.

RANGE.—From the coast region of British Columbia south through Washington, Oregon, and California (to Mendocino County).

NAMES IN USE.—Vine Maple (central and northern Cal.; Oregon—Willamette Valley); Mountain Maple.

**Acer glabrum** Torr.

Dwarf Maple.

RANGE.—From British Columbia westward and southward over the mountains of the West to California (on Sierra Nevada Mountains to Yosemite Valley), Colorado (eastern slopes of Rocky Mountains), eastern New Mexico, and western Arizona.

NAMES IN USE.—Dwarf Maple (Oreg., Utah, Cal., Colo.); Mountain Maple (Colo., Mont.); Soft Maple (Utah); Shrubby Maple (Utah); Bark Maple (Idaho); Maple (Mont.).

**Acer saccharum** Marsh.

Sugar Maple.

ACER SACCHARINUM Wang.

RANGE.—From southern Newfoundland (along the St. Lawrence and Saguenay rivers, Lake St. John, and northern borders of Great Lakes) to Lake of the Woods and Minnesota; south (through the Northern States and on the Allegheny Mountains) to northern Georgia and western Florida; west to eastern Nebraska, eastern Kansas, and eastern Texas.

NAMES IN USE.—Sugar Maple (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ala., La., Ky., Mo., Ohio, Ill., Ind., Iowa, Kans., Nebr., Mich., Minn., Wis., Ont.); Hard Maple (Vt., R. I., N. Y., N. J., Pa., Va., Ala., Ky., Mo., Kans., Nebr., Ill., Ind., Iowa, Mich., Ohio, Minn., Ont.); Sugar-tree (Me., Vt., R. I., Pa., Va., W. Va., Ala., Miss., La., Ark., Ky., Mo., Ill., Ind., Ohio, Kans.); Rock Maple (Me., Vt., N. H., Conn., Mass., R. I., N. Y., Tenn., Ill., Mich., Iowa, Kans., Wis., Minn., Ont.); Black Maple (Fla., Ky., N. C.); Maple (S. C.).

**Acer saccharum nigrum** (Michx. f.) Britton.

Black Maple.

ACER SACCHARINUM Wang.

RANGE.—From Vermont (Lake Champlain) to Minnesota, eastern Kansas, and southwestern Arkansas; southward (west of the Allegheny Mountains) to northern Alabama and Mississippi (Chickasaw River).

NAMES IN USE.—Black Sugar Maple (Mich., Mo.); Black Maple (Mich., Iowa); Hard Maple (Minn.).

VARIETY DISTINGUISHED IN CULTIVATION.

**Acer saccharum nigrum monumentale** (Temple) Sudw.

**Acer saccharum barbatum** (Michx.) Trelease.

RANGE.—Nearly the same as the preceding, but insufficiently known.

**Acer saccharum leucoderme** (Small) Sudworth.

Whitebark Maple.

RANGE.—North Carolina to Georgia and Alabama.

**Acer saccharum floridanum** (Chapm.) Small & Heller.

Florida Maple.

**ACER SACCHARINUM** Wang. var. **FLORIDANUM** Chapm.

RANGE.—From western Florida through southern Alabama (to central prairie region) to Texas (Cibola River) and into Mexico (Sierra Madre Mountains in Nuevo Leon).

**Acer saccharum grandidentatum** (Nutt.) Sudworth.

**Large-tooth Maple.**

**ACER GRANDIDENTATUM** (Nutt. n. sp.) in Torr. & Gr.

RANGE.—Montana (head waters of Columbia River); Utah (Wasatch Mountains); southern Arizona (Huachuaca Mountains and others); New Mexico (Mogollon Mountains); western Texas (Guadalupe Mountains); Mexico (mountains of Coahuila).

NAMES IN USE.—Western Sugar Maple; Hard Maple (Utah); Large-toothed Maple.

**Acer saccharinum** Linn.

**Silver Maple.**

**ACER DASYCARPUM** Ehr.

RANGE.—From New Brunswick (St. Johns River) to western Florida; west to southern Ontario, through Michigan to eastern Dakota, Nebraska, Kansas (Blue River), and Indian Territory.

NAMES IN USE.—Silver Maple (Me., Vt., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Fla., Miss., Ky., Ohio, Ill., Ind., Mo., Kans., Nebr., Iowa, Mich., Minn., S. Dak.); Soft Maple (Vt., N. H., Mass., R. I., N. Y., N. J., Pa., W. Va., Ala., Miss., La., Tex., Mo., Ohio, Mich., Ont., Ill., Ind., Kans., Nebr., Iowa, Wis., Minn., S. Dak.); White Maple (Me., Vt., R. I., N. Y., N. J., Pa., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Ky., Mo., Ill., Ind., Kans., Nebr., Minn.); River Maple (Me., N. H., R. I., W. Va., Minn.); Silver-leaved Maple (Del., N. J.); Water Maple (Pa., W. Va.); Creek Maple (W. Va.); Swamp Maple (W. Va., Md.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Acer saccharinum pendulum** (Nich.) Sudw.

**Weeping Silver Maple.**

**Acer saccharinum aureo-variegatum** (Nich.) Sudw.

**Variegated Silver Maple.**

**Acer saccharinum wierii** (Pax) Sudw.

**Cutleaf Silver Maple.**

**Acer saccharinum dissectifolium** Sudw.

**Acer saccharinum lutescens** (Pax) Sudw.

**Acer saccharinum novum** (Ellw. & Barn.) Sudw.

**Crisp-leaf Silver Maple.**

**Acer rubrum** Linn. *Leaves white beneath* **Red Maple.**

RANGE.—From New Brunswick, Quebec, and Ontario (latitude 49°) to Florida (Caloosa and Indian rivers); west to Lake of the Wood, eastern Dakota and Nebraska, Indian Territory, and Texas (Trinity River).

NAMES IN USE.—Red Maple (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ky., Mo., Ill., Ind., Ohio, Ont., Iowa, Wis., Nebr.); Swamp Maple (Vt., N. H., Mass., Conn., R. I., N. Y., N. J., Pa., Del., N. C., S. C., Fla., Ala., Miss., La., Tex., Mo., Ind., Ont., Minn.); Soft Maple (Vt., Mass., N. Y., Va., Miss., Mo., Ill., Ind., Ohio, Ont., Mich., Kans., Nebr., Minn.); Water Maple (Miss., La., Tex., Ky., Mo.); White Maple (Me., N. H.); Shoe-peg Maple (W. Va.); Erable (La.); Ah-weh-hot-kwah = "Red Flower" (Onondaga Indians, N. Y.); Scarlet Maple (Tex.).

*small seeds.*

**Acer rubrum drummondii** (Hook. & Arn.) Sargent.**Drummond Maple.**

RANGE.—Southern Georgia and Alabama (coast plain), southwestern Tennessee (Covington), western Louisiana, southern Arkansas, eastern Texas.

VARIETY DISTINGUISHED IN CULTIVATION.

**Acer rubrum sanguineum** (Spach) Pax.

**Acer negundo** Linn.

*Compound leaves*

**Boxelder.**

**NEGUNDO ACEROIDES** Moench.

RANGE.—Vermont (Lake Champlain and Winooski River), New York (Cayuga Lake), eastern Pennsylvania, and south to Florida (Hernando County); northward to Winnipeg (Dogs Head Lake and along southern branch of the Saskatchewan River), to the eastern base of the Rocky Mountains (in British America), to Montana (Rocky Mountains), Utah (Wasatch Mountains), western Texas, New Mexico, and eastern Arizona.

NAMES IN USE.—Boxelder (Vt., Mass., R. I., Del., N. Y., N. J., Pa., Va., W. Va., N. C., S. C., Ala., Fla., Miss., La., Tex., Ark., Mo., Ariz., N. Mex., Mont., Ill., Ind., Wis., Ohio, Mich., Iowa, Kans., Nebr., N. Dak., S. Dak., Minn.); Ash-leaved Maple (R. I., Mass., N. J., Pa., Del., Va., S. C., La., Tex., Ill., Wis., Iowa, Ont., Kans., Nebr., Mont., N. Dak., Mich., Minn.); Cut-leaved Maple (Colo.); Negundo Maple (Ill.); Red River Maple (N. Dak.); Three-leaved Maple (Pa.); Black Ash (Tenn.); Stinking Ash (S. C.); Sugar Ash (Fla.); Water Ash (Dakotas).

**Acer negundo californicum** (T. & Gr.) Sargent.

**California Boxelder.**

**NEGUNDO CALIFORNICUM** Torr. & Gr.

RANGE.—Southern California (valley lower Sacramento River; valleys and coast ranges from San Francisco Bay to about latitude 35°; western slopes San Bernardino Mountains).

NAMES IN USE.—Box Elder (Cal.); Maple (Cal.); False Maple (Cal.).

VARIETIES DISTINGUISHED IN CULTIVATION.

**Acer negundo variegatum** Kuntze.

**Acer negundo angustissimum** (Pax) Sudw.

**Acer negundo crispifolium** Sudw.

**Acer negundo violaceum** (Koch) Dipp.

*curl-leaf Boxelder.*

## Family HIPPOCASTANACEÆ.

### **ÆSCULUS** Linn.

**Æsculus glabra** Willd.

**Ohio Buckeye.**

RANGE.—From Pennsylvania (western slopes Allegheny Mountains) to northern Alabama (Tennessee River Valley and mountains) and west to southern Iowa, central Kansas, and Indian Territory.

NAMES IN USE.—Ohio Buckeye (Miss., Ga., Ark., Mo., Ohio); Buckeye (Pa., Ky., Mo., Ill., Ind., Ohio, Iowa, Kans.); Fetid Buckeye (W. Va.); Stinking Buckeye (Ala., Ark.); American Horse Chestnut (Pa.).

*wood very light*  
**Æsculus octandra** Marsh.

**ÆSCULUS FLAVA** Ait.

*2 ft. of spines. Only species good for timber*  
RANGE.—From Pennsylvania (Allegheny County and along the Allegheny Mountains to Georgia (Augusta) and northern Alabama (mountains); westward to southern Iowa, Indian Territory, and western Texas (upper Cibolo River, near Boerne).

NAMES IN USE.—Buckeye (N. C., S. C., Ala., Miss., La., Tex., Ky.); Sweet Buckeye (W. Va., Miss., Tex., Mo., Ind.); Yellow Buckeye (S. C., Ala.); Large Buckeye (Tenn.); Big Buckeye (Tex., Tenn.); Ohio Buckeye (Pa., cult.)

**Æsculus octandra hybrida** (de C.) Sargent.

**Purple Buckeye.**

**ÆSCULUS FLAVA** Ait. var. **PURPURASCENS** Gray.

RANGE.—From West Virginia southward (on Allegheny Mountains); Texas.

**Æsculus californica** (Spach) Nutt.

**California Buckeye.**

RANGE.—California (from Sacramento River in Mendocino County along coast ranges to San Luis Obispo County; western foothills of Sierra Nevada Mountains to northern slopes of Tejon Pass in Kern County; Antelope Valley of San Gabriel Mountains in Los Angeles County). *resinous wood.*

NAMES IN USE.—California Buckeye (Cal.); Horse Chestnut (Cal.).

*One of western broadleaves*  
**Biffoctactanum** = **Eurostaphyle**

**Æsculus parviflora** = **chirub**

**UNGNADIA** Endl.

*Austrina.*

**Ungnadia speciosa** Endl.

**Texas Buckeye.**

RANGE.—From Texas (Trinity River) to New Mexico (Organ Mountains), and southward into Mexico (Sierra Madre Mountains in Nuevo Leon and mountains of Chihuahua).

NAMES IN USE.—Spanish Buckeye (Tex.); Texas Buckeye (Tex.).

## **SAPINDUS** Linn.

**Sapindus saponaria** Linn.

**Soapberry.**

RANGE.—Southern Florida (Cape Sable, shores and islands of Caximbas Bay and Biscayne Bay) and keys (Key Largo and Elliotts Key); West Indies and Venezuela.

NAMES IN USE.—False Dogwood (Fla.); Soapberry (Fla.).

**Sapindus marginatus** Willd.

**Wild China.**

RANGE.—From Georgia (Savannah River) to Florida (St. Johns River on the east coast and on the west coast from Cedar Keys to Manatee River); Alabama (escaped from cultivation and running wild near Mobile); from western Louisiana to southern Arkansas (Washita River) and southern Kansas, through Texas to southern New Mexico, southern Arizona, and into northern Mexico.

NAMES IN USE.—Soapberry (Fla., La., Tex., Ark.); Wild China (Fla., La., Tex.); Chinaberry (N. Mex.).

## **EXOTHEA** Macfadyen.

**Exothea paniculata** (Juss.) Radlk.

**Inkwood.**

**HYPELATE PANICULATA** Camb.

RANGE.—Southern Florida (from Mosquito Inlet to the southern keys); San Domingo, Cuba, and Jamaica.

NAMES IN USE.—Inkwood (Fla.); Ironwood.

**HYPELATE** Browne.**Hypelate trifoliata** Swartz.**White Ironwood.**

RANGE.—Florida keys (Upper Metacombe and Umbrella keys); Jamaica and Cuba.

NAME IN USE.—White Ironwood (Fla.).

Family **RHAMNACEÆ.****REYNOSIA** Griseb.**Reynosia latifolia** Griseb.**Red Ironwood.**

RANGE.—Southern Florida (Marquesas Islands to Biscayne Bay); Cuba, Virgin and Bahama islands.

NAMES IN USE.—Red Ironwood (Fla.); Darling Plum (Fla.).

**CONDALIA** Cav.**Condalia obovata** Hook.**Bluewood.**

RANGE.—Western Texas (Matagorda Bay to the Rio Grande River) and north-eastern Mexico.

NAMES IN USE.—Bluewood (Tex.); Logwood (Tex.); Purple Haw (Tex.).

**RHAMNIDIUM** Reissek.**Rhamnidium ferreum** (Vahl) Sargent.**Black Ironwood.****CONDALIA FERREA** Griseb.

RANGE.—Southern Florida (coast from Cape Canaveral and keys to Biscayne Bay); St. Croix, San Domingo, St. Thomas, Puerto Rico, and Jamaica.

NAME IN USE.—Black Ironwood (Fla.).

**RHAMNUS** Linn.**Rhamnus crocea** Nutt.**Evergreen Buckthorn.**

RANGE.—California (upper Sacramento River, west of Sierra Nevada Mountains, to latitude 29°) to Lower California (Guadalupe Islands).

**Rhamnus crocea insularis** (Greene) Sargent.

RANGE.—Southern California (Cedros and Santa Barbara islands and adjacent mainland).

**Rhamnus pirifolia** Greene.

RANGE.—Off coast southern California (Santa Cruz Islands).

**Rhamnus caroliniana** Walt.**Yellow Buckthorn.**

RANGE.—From New York (Long Island) to Florida, and west (through the Ohio River Valley) to eastern Nebraska, eastern Kansas, and eastern Texas.

NAMES IN USE.—Indian Cherry (W. Va., N. C., Miss., La., Tex., Ark., Nebr.); Buckthorn (Ark., Iowa, Nebr.); Alder Buckthorn (Tex., Nebr.); Yellow-wood (Ala., Fla., La.); Stinkwood (La.); Bog Birch (Minn.); Stink Berry (Nebr.); Stink Cherry (Nebr.); Carolina Buckthorn (S. C., Pa.); Polecat-tree (Tex.); Polecat-wood (Ark.); Brittle-wood (Ark.).

*Renders a drug.*

**Rhamnus purshiana** de C.

**Cascara Buckthorn.**

RANGE.—From Puget Sound southward into Lower California; eastward through northern Washington to Idaho (Bitter Root Mountains), Montana (Flat Head Lake); eastern slopes Sierra Nevada Mountains; mountains of Colorado and western Texas.

NAMES IN USE.—Shittimwood (Oreg., Idaho, Wash.); Cascara Sagrada (Cal., Oreg.); Bearberry (Oreg., Idaho, Wash.); Bearwood (Oreg.); Yellow-wood (Oreg.); Buckthorn (Idaho); Pigeon-berry (Idaho); Oregon Bearwood (Oreg., Wash.); Coffee-berry (Cal.); Wild Coffee-bush (Cal.); Western Coffee (Oreg., Cal.); Bayberry (Oreg., Cal.); Wild Coffee (Cal.); California Coffee (Cal.).

**CEANOTHUS** Linn.

**Ceanothus thyrsiflorus** Esch.

**Blue Myrtle.**

RANGE.—Western California (from Mendocino County to San Luis Rey River).

NAMES IN USE.—Blue Myrtle; California Lilac (Cal.); Wild Lilac (Cal.); Blue Blossom (Cal.).

**Ceanothus arboreus** Greene.

**Tree Myrtle.**

RANGE.—Off coast of southern California (Santa Catalina, Santa Cruz, Santa Rosa Islands).

**COLUBRINA** Brongn.

**Colubrina reclinata** (L'Hér.) Brongn.

**Naked-wood.**

RANGE.—Southern Florida (Umbrella Key, north end of Key Largo, and islands south of Elliotts Key); Jamaica, San Lucia, St. Vincent, Cuba, St. Croix, Haiti, Virgin and Bahama islands.

NAMES IN USE.—Naked-wood (Fla.); Soldierwood (Fla.).

**FAMILY TILIACEÆ.**

**TILIA** Linn.

**Tilia americana** Linn.

**Basswood.**

RANGE.—New Brunswick to Virginia and (along Allegheny Mountains) to Georgia and Alabama (mountains); west (in Canada) to Lake Superior (eastern shores) and to Lake Winnipeg (southern shores) and Assiniboine River (in United States), to eastern Dakota, eastern Nebraska, Kansas, Indian Territory, and eastern Texas.

*igu*  
*ark.* NAMES IN USE.—Basswood (Me., N. H., Vt., R. I., Mass., Conn., N. Y., N. J., Del., Pa., W. Va., D. C., N. C., S. C., Ga., Ala., Miss., La., Ark., Ky., Ill., Ind., Iowa, Wis., Mich., Ohio, Ont., Nebr., Kans., Minn., N. Dak.); American Linden (Me., N. H., R. I., N. Y., Pa., Del., N. C., Miss., Ohio, Ill., Nebr., N. Dak., Ont., Minn.); Linn (Pa., Va., W. Va., Ala., La., Ill., Ind., Ohio, Mo., Iowa, Kans., Nebr., Wis., S. Dak.); Linden (Vt., R. I., Pa., W. Va., Nebr., Minn.); Limetree (R. I., N. C., S. C., Ala., Miss., La., Ill.); Whitewood (Vt., W. Va., Ark., Minn., Ont.); Beetree (Vt., W. Va., Wis.); Black Limetree (Tenn.); Smooth-leaved Limetree (Tenn.); White Lind (W. Va.); Wickup (Mass.); Yellow Basswood (Ind.); Lein (Ind.).

**Tilia pubescens** Ait.

**Downy Basswood.**

**TILIA AMERICANA 3 PUBESCENS** Loud.

RANGE.—New York (Long Island—swamp in Wading River, Suffolk County); coast of North Carolina, South Carolina, Georgia; northern Florida, Louisiana, Texas (Rio Blanco River). Range insufficiently known.

NAME IN USE.—Wahoo (Fla.).



**Tilia pubescens leptophylla** Vent. Thinleaf Downy Basswood.

RANGE.—Louisiana; local.

**Tilia heterophylla** Vent. *leaves white below* White Basswood.

RANGE.—From Pennsylvania (through the Allegheny Mountains) to western and central Florida (Lake Charm in Orange County) and Alabama (Tennessee River valley to central prairie region); west to southern Indiana and Illinois, Kentucky and Tennessee (to Nashville).

NAMES IN USE.—White Basswood (Ind., Ala.); Wahoo (Ga., Fla.); Wild Linden; Smooth-fruited, White-leaved Limetree (Tenn.); Large-leaved Limetree (Tenn.); Silverleaf Poplar (Ky.); Cottonwood (Ky.); Lin (Ind., Tenn.).

*Tilia Michauxii & Chamaecrista*

Family CACTACEÆ.

CEREUS Mill.

**Cereus giganteus** Engelm.

Giant Cactus.

RANGE.—Central and southern Arizona (from Bill Williams River to the San Pedro River) and southward into Mexico (Sonora).

NAMES IN USE.—Giant Cactus (N. Mex., Ariz.); Saguaro (Ariz.); Saguaro (Ariz.).

**Cereus thurberi** Engelm.

Thurber Cactus.

RANGE.—Southwestern Arizona; Mexico (Sonora); Lower California.

NAMES IN USE.—Pitahaya (Mex.); Pitahaya dulce (Mex.).

**Cereus schottii** Engelm.

Schott Cactus.

RANGE.—Southern Arizona; Mexico (Sonora); Lower California.

NAMES IN USE.—Zina, Sina, Sinita, Hombre viejo, and Cabeza vieja (Ariz., Mex.).

OPUNTIA<sup>1</sup> Mill.

**Opuntia fulgida** Engelm.

Cholla.

RANGE.—From southern Nevada (Cottonwood Springs) through Arizona (south of Colorado plateau in Pima, Maricopa, Pinal, and Cochise counties) into Mexico (Sonora), and Lower California.

**Opuntia fulgida mammillata** (Scott) Coult.

RANGE.—Through southern Arizona (southern foothills of Santa Catalina Mountains, etc.) into Mexico (Sonora).

Although several species of Opuntias have long been known to be of tree-like form and dimensions, these arborescent species have usually not been considered strictly trees. It is evident, however, that they should be regarded as true trees, both from their tree-like form, and also from their truly woody internal structure. Prof. J. W. Toumey, of the University of Arizona, who has conducted many critical studies on southwestern Cactaceæ, writes the following concerning one of the tree Opuntias:

"The reticulated wood is used to some extent in the manufacture of light furniture, fancy articles, canes, picture frames, etc. A factory was established in Salt River Valley (Arizona) some three years ago for the purpose of manufacturing articles from this wood."

For excellent illustrations of the general appearance of these trees, the reader is referred to following articles by Professor Toumey: *Opuntia fulgida*, Garden and Forest, VIII, 324, f. 45, 1895; *Opuntia arborescens*, Garden and Forest, IX, 2, f. 1, 1896.

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*Cactus would be good forage plants is there were no things.*

**Opuntia versicolor** Engelm.<sup>1</sup>

RANGE.—Southern Arizona (foothills and low mountains).

**Opuntia sponsior** (Engelm.) Tonnay.<sup>2</sup>

RANGE.—Southern Arizona. Range not yet perfectly known.

**Opuntia sponsior neomexicana** Tonnay.<sup>2</sup>

RANGE.—Southern Arizona.

## Family RHIZOPHORACEÆ.

**RHIZOPHORA** Linn.**Rhizophora mangle** Linn.**Mangrove.**

RANGE.—Southern coast of Florida (Mosquito Inlet and Cedar Keys to southern islands); Mississippi delta; Texas coast; eastern and western coasts of Mexico; Lower California; from Central America along northern and eastern coast of South America to the limits of the tropics; Bermudas, Bahamas, West Indies; Galapagos Islands.

NAME IN USE.—Mangrove (Fla.).

## Family MYRTACEÆ.

**ANAMOMIS** Griseb.**Ananomis dichotoma** (Poir.) Sargent.**Naked Stopper.**

EUGENIA DICHOTOMA de C.

RANGE.—Florida coast (Mosquito Inlet to Cape Canaveral on the east, and on the west Caloosa River to Cape Romano; Key West, Biscayne Bay); West Indies.

NAMES IN USE.—Naked-wood (Fla.); Naked Stopper.

**CHYTRACULIA** Browne.**Chytraculia chytraculia** (Linn.) Sudworth.**Stopper.**

CALYPTRANTHES CHYTRACULIA Swartz.

RANGE.—Florida (Lake Worth; Key West, Key Largo; Biscayne Bay); West Indies and southern Mexico.

**Chytraculia chytraculia genuina** (Berg.) Sudw.

**Chytraculia chytraculia ovalis** (Berg.) Sudw.

**Chytraculia chytraculia trichotoma** (Berg.) Sudw.

**Chytraculia chytraculia pauciflora** (Berg.) Sudw.

**Chytraculia chytraculia zuzygium** (Linn.) Sudw.

**EUGENIA** Linn.**Eugenia buxifolia** (Swartz) Willd.**Gurgeon Stopper.**

RANGE.—Florida coast (on the east, Cape Canaveral to southern key; and on the west, Caloosa River to Cape Sable).

<sup>1</sup> In Coulter, Contr. U. S. Nat. Herb., III, 452, 1896.

<sup>2</sup> Bot. Gaz., XXV, 119, 1898.

**Eugenia monticola** (Swartz) de C. **White Stopper.**

RANGE.—Florida coast (St. Johns River to Key Largo, Key West, Upper Metacombe Key, Elliotts Key); West Indies.

NAMES IN USE.—White Stopper (Fla.); Stopper (Fla.).

**Eugenia procera** (Swartz) Poir. **Red Stopper.**

RANGE.—Florida keys (Key West and Umbrella Key); San Domingo, Cuba, Jamaica, Santa Cruz, Martinique.

NAMES IN USE.—Red Stopper (Fla.); Spiceberry (Fla.).

**Eugenia garberi** Sargent. **Garber Stopper.**

**EUGENIA PROCERA** Sargent.

RANGE.—Florida (hammock, three-fourths mile east of mouth of Miami River; Old Rhodes Key and Elliotts Key; Bahamas (one), New Providence Island, West Indies (Antigua)).

## Family COMBRETACEÆ.

### **TERMINALIA** Benth. & Hook.

**Terminalia buceras** (Browne) Benth. & Hook. **Black Olivetree.**

RANGE.—Southern Florida (Elliotts Key); West Indies, coast Caribbean Sea, and Bay of Panama.

### **CONOCARPUS** Linn.

**Conocarpus erecta** Linn. **Florida Buttonwood.**

RANGE.—Coast of southern Florida (Cape Canaveral and Cedar Keys to southern islands West Indies); Central and South America; Galapagos Islands; east coast of Africa.

NAMES IN USE.—Buttonwood (Fla.).

**Conocarpus erecta arborea** de C.

**Conocarpus erecta procumbens** (Linn.) de C.

**Conocarpus erecta sericea** de C.

### **LAGUNCULARIA** Gaertn. f.

**Laguncularia racemosa** (Linn.) Gaertn. f. **White Buttonwood.**

RANGE.—Coast of southern Florida (Cape Canaveral and Cedar Keys to southern islands); West Indies, Mexico, Central and South America, and western Africa.

NAMES IN USE.—White Buttonwood (Fla.); White Mangrove (Fla.); Buttonwood (Fla.).

## Family ARALIACEÆ.

### **ARALIA** Linn.

**Aralia spinosa** Linn. **Angelica-tree.**

RANGE.—From Pennsylvania (Allegheny Mountains in Clearfield, Cambria, Westmoreland, and Fayette counties) to Florida, and to southern Indiana, southeastern Missouri, Arkansas, and eastern Texas.

NAMES IN USE.—Angelica-tree, Hercules' Club.

## Family CORNACEÆ.

## CORNUS Linn.

**Cornus florida** Linn.**(Flowering) Dogwood.**

RANGE.—From eastern Massachusetts to central Florida, and west through southern Ontario, southern Michigan (up to Montcalm County) to southwestern Missouri and Texas (Brazos River); Mexico (Sierra Madre Mountains).

NAMES IN USE.—Flowering Dogwood (Mass., R. I., N. Y., N. J., Del., Pa., Va., N. C., S. C., Miss., La., Ark., Mo., Ill., Kans., Mich., Ont., Ohio, Ind.); Dogwood (N. J., Pa., Del., W. Va., N. C., S. C., Ala., Fla., La., Ky., Ohio, Ind., Mich.); Boxwood (Conn., R. I., N. Y., Miss., Mich., Ky., Ind., Ont.); False Box-dogwood (Ky.); New England Boxwood (Tenn.); Flowering Cornel (R. I.); Cornel (Tex.).

## VARIETIES DISTINGUISHED IN CULTIVATION.

*Cornus florida pendula* Temple.

**Weeping Dogwood.**

*Cornus florida rubra* Temple.

**Red-bract Dogwood.**

**Cornus nuttallii** And.**(Pacific) Dogwood.**

RANGE.—From southern coast of British Columbia (Lower Fraser River and Vancouver Island) through Washington, Oregon, and California (coast ranges to San Bernardino Mountains and western slopes of Sierra Nevada Mountains).

NAMES IN USE.—Dogwood (Cal., Oreg., Wash.); California Dogwood (Cal.); Flowering Dogwood (Oreg., Cal.); Western Dogwood.

**Cornus alternifolia** Linn. f.**Blue Dogwood.**

RANGE.—From Nova Scotia and New Brunswick (through St. Lawrence River Valley) to Lake Superior (northern shores) and Minnesota; south through the Northern States (and along the Allegheny Mountains) to northern Georgia and Alabama.

NAMES IN USE.—Dogwood (Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Va., W. Va., N. C., Ga., Fla., Miss., La., Ark., Ky., Ill., Wis., Minn., Ohio, Ont.); Blue Dogwood (Pa.); Purple Dogwood (Pa.); Umbrella-tree (R. I.); Pigeonberry (N. Y.); Alternate-leaved Dogwood (Mich.); Green Osier (Vt.).

and to count the **NYSSA** rings. *hard to split*  
**Nyssa sylvatica** Marsh. **Black Gum.**

**NYSSA MULTIFLORA** Wang. *Burns slowly.*

RANGE.—From Maine (Kennebec River) to Florida (Kissimmee River and Tampa Bay) and west to southern Ontario, southern Michigan (up to Gratiot County), southeastern Missouri, and Texas (Brazos River).

NAMES IN USE.—Black Gum, (N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Ala., Fla., Miss., La., Tex., Ill., Ind.); Sour Gum (Vt., Mass., R. I., N. Y., N. J., Pa., Del., Va., W. Va., S. C., Fla., Tex., Ohio, Ind., Ill.); Tupelo (Mass., R. I., N. J., Del., S. C., Ala., Fla., Miss., Tex., Ill., Ohio); Pepperidge (Vt., Mass., R. I., N. Y., N. J., S. C., Tenn., Mich., Ohio, Ont.); Wild Peartree (Tenn.); Yellow Gumtree (Tenn.); Gum (Md.); Stinkwood (W. Va.); Tupelo Gum (Fla.).

## VARIETY DISTINGUISHED IN CULTIVATION.

**Nyssa sylvatica pendula** (Temple) Sudw.

**Nyssa biflora** Walt.

**Water Gum.**

**NYSSA AQUATICA** Linn.

RANGE.—Maryland (Montgomery County) to Florida and central Alabama.

**Nyssa ogeche** Marsh.

**Sour Tupelo.**

**NYSSA CAPITATA** Walt.

RANGE.—From southern borders of South Carolina (near coast and through the Ogeechee River Valley in Georgia) to northern Florida (Clay County) and western Florida (Washington County).

NAMES IN USE.—Sour Tupelo (S. C., Fla.); Ogeechee Lime (S. C. Fla.); Gopher Plum (Fla.); Tupelo; Wild Limetree; Limetree.

**Nyssa aquatica** Linn. *Peckham* **Cotton Gum.**

**NYSSA UNIFLORA** Wang.

RANGE.—Coast region from southern Virginia to northern Florida, and through the Gulf States to Texas (Nueces River); northward through Arkansas, west Tennessee and Kentucky, southern and southeastern Missouri to southern Illinois (lower Wabash River).

NAMES IN USE.—Large Tupelo (Ala., La., Tex.); Tupelo Gum (Ga., Ala., Miss., La.); Sour Gum (Ark., Mo.); Swamp Tupelo (S. C., La.); Cotton Gum (N. C., S. C., Fla.); Tupelo (N. C., S. C.); Wild Olivetree (La.); Olivier à grandes feuilles (La.); Olivetree (Miss.).

## Family ERICACÆ.

### **VACCINIUM** Linn.

**Vaccinium arboreum** Marsh.

**Tree Huckleberry.**

RANGE.—From North Carolina to Florida (Hernando County) and through the Gulf States to eastern Texas (Matagorda Bay); northward through Arkansas and Tennessee to southern Illinois and Missouri.

NAMES IN USE.—Huckleberry (N. C., S. C., Fla., Miss., La., Mo.); Sparkleberry (N. C., S. C., Ala., Fla.); Myrtle Berries (La.); Bluet (La.); Tree Huckleberry (S. C.); Gooseberry (N. C.).

### **ARBUTUS** Linn.

**Arbutus menziesii** Parsh.

**Madroña.**

RANGE.—Coast region from British Columbia (islands at Seymour Narrows) to California (coast ranges to Santa Lucia Mountains).

NAMES IN USE.—Madroña (Cal., Oreg.); Madrove (Cal.); Laurel-wood (Oreg.); Madrone-tree; Laurel (Oreg.); Manzanita (Oreg.).

**Arbutus xalapensis** H. B. K.

**Mexican Madroña.**

**ARBUTUS XALAPENSIS** var. **TEXANA** Gray.

RANGE.—Texas (Travis and Hays—Rio Blanco River—counties to Eagle and Guadalupe mountains); Mexico (Sierra Madre Mountains in Nuevo Leon, to mountains near Jalapa).

NAMES IN USE.—Manzanita; Madroña; Madrone-tree; Laurel.

**Arbutus arizonica** (Gray) Sargent.**Arizona Madroña.**

ARBUTUS XALAPENSIS var. ARIZONICA Gray.

RANGE.—Southern Arizona (Santa Catalina and Santa Rita mountains); southward into Mexico (Sierra Madre Mountains in Chihuahua).

**ANDROMEDA** Linn.**Andromeda ferruginea** Walt.**Andromeda.**

RANGE.—Coast region from South Carolina to Florida (Cedar Keys on west coast); Mexico (region of San Luis Potosi, mountains of Oaxaca, Orizaba, Jitotole, and Talea); West Indies.

NAME IN USE.—Titi (Fla.).

**Andromeda ferruginea arborescens** Michx.**Andromeda ferruginea fruticosa** Michx.**OXYDENDRUM** de C.**Oxydendrum arboreum** (Linn.) de C.**Sourwood.**

RANGE.—From Pennsylvania (Mount Pleasant, in Westmoreland County, and along the Allegheny Mountains) to western Florida and southern Alabama (eastern shores Mobile Bay), westward to southern Indiana, Arkansas (mountains) and western Louisiana.

NAMES IN USE.—Sourwood (W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Ky., Ohio); Sorrel-tree (Pa., N. C., S. C., Miss., La., Ohio); Sour Gum Bush (Ohio); Sour Gum (W. Va.); Arrow-wood (W. Va.); Titi (S. C.); Lily of the Valley-tree.

**KALMIA** Linn.**Kalmia latifolia** Linn.**Mountain Laurel.**

RANGE.—From New Brunswick to Lake Erie (northern shores and mainly along the Appalachian Mountains) to western Florida; west through the Gulf States to western Louisiana and Arkansas (Red River).

NAMES IN USE.—Laurel (N. H., Vt., Mass., R. I., Conn., N. J., N. Y., Pa., Del., Va., W. Va., N. C., S. C., Miss., La., Mo.); Calico Bush (Vt., R. I., N. Y., Pa., Del., N. C., S. C., Ala., Miss., La.); Spoonwood (N. H., Mass., R. I., Pa., Miss.); Ivy (Conn., Md., Va., N. C., S. C., Miss.); Poison Ivy (Tenn., Ala.); Poison Laurel (Ala.); Mountain Laurel (Vt., Mass., W. Va., Ky., Tenn.); Sheep Laurel (Pa.); Wood Laurel (Pa.); Small Laurel (W. Va.); Kalmia (Pa., S. C.); Calico-tree (Tenn.); Calico Flower (Tenn.); Mountain Ivy (Va.); Big-leaved Ivy (lit. domestic medicine); Ivywood (S. C.).

**RHODODENDRON** Linn.**Rhododendron maximum** Linn.**Great Rhododendron.**

RANGE.—From Nova Scotia to Lake Erie (north shores) and southward in New England and New York (and along the Allegheny Mountains) to northern Georgia.

NAMES IN USE.—Great Laurel (N. H., Mass., R. I., N. Y., N. J., Pa., N. C., Minn.); Rose Bay (R. I., Pa., N. C., S. C.); Bigleaf Laurel (Pa.); Big Laurel (W. Va.); Laurel (R. I., Va., N. C., S. C.); Mountain Laurel (Pa., S. C.); Rhododendron (R. I., N. Y., Pa., Va., S. C.); Dwarf Rose Bay-tree (Tenn.); Spoon Hetch (N. H.); Wild Rose Bay and Deertongue Laurel (lit. of domestic medicine).

## VARIETIES DISTINGUISHED IN CULTIVATION.

**Rhododendron maximum roseum** Pursh.**Rhododendron maximum purpureum** Pursh.**Rhododendron maximum album** Pursh.**Rhododendron catawbiense** Michx.      **Catawba Rhododendron.**

RANGE.—Mountains from Virginia and West Virginia to Georgia and Alabama (Lookout Mountain, on Little Liver in Dekalb County).

## Family MYRSINACEÆ.

**ICACOREA** Aublet.**Icacorea paniculata** (Nutt.) Sudworth.**Marlberry.****ARDISIA PICKERINGIA** Nutt.

RANGE.—Coast of southern Florida (on the east coast from Mosquito Inlet to southern islands and on the west coast from Caloosa River to Cape Romano); Bahamas, Cuba, and southern Mexico.

NAMES IN USE.—Marlberry (Fla.); Cherry (Fla.).

**JAQUINIA** Linn.**Jaquinia armillaris** Jacq.**Joewood.**

RANGE.—Off the coast of southern Florida (Sanibel Islands to southern keys and Everglades); Mexico, Central America, Venezuela, and northern Brazil.

NAME IN USE.—Joewood (Fla.).

## Family SAPOTACEÆ.

**CHRYSOPHYLLUM** Linn.**Chrysophyllum monopyrenum** Swartz.**Satinleaf.****CHRYSOPHYLLUM OLIVIFORME** Lam.

RANGE.—Coast of southern Florida (on the east coast from Mosquito Inlet to southern keys and on the west coast from Caloosa River to Cape Sable); Bahamas and West Indies.

NAME IN USE.—Satinleaf (Fla.).

**SIDEROXYLON** Linn.**Sideroxylon mastichodendron** Jacq.**Mastic.**

RANGE.—Coast of southern Florida (on the east coast from Cape Canaveral to southern keys and on the west coast from Cape Romano to Cape Sable); Bahamas and West Indies.

NAME IN USE.—Mastic (Fla.); Wild Olive (Fla.).

**BUMELIA** Swartz.**Bumelia tenax** (Linn.) Willd.**Tough Bumelia.**

RANGE.—Coast region North Carolina to Florida (Cape Canaveral and Cedar Keys).

NAMES IN USE.—Black Haw (Fla.); Tough Buckthorn (S. C.); Iron wood (S. C., Fla.).

**Bumelia lanuginosa** (Michx.) Pers.**Shittimwood.**

RANGE.—From southern Georgia and northern Florida through Alabama (Tennessee River Valley to coast plain); from southern Illinois and southern Missouri through Arkansas and Texas to Mexico (Nuevo Leon).

NAMES IN USE.—Gum Elastic; Shittimwood (Tex.); Black Haw (Fla.).

**Bumelia lanuginosa rigida** Gray.

RANGE.—Western Texas to Arizona and south into Mexico (Nuevo Leon).

**Bumelia lycioides** (Linn.) Gärtn. f.**Buckthorn Bumelia.**

RANGE.—From southern Virginia to Florida (Mosquito Inlet and Caloosa River) and west to southern Illinois, southern Missouri, Arkansas, and Texas (Rio Concho River).

NAMES IN USE.—Ironwood (Va., S. C., Ga., Fla., Miss., Ky.); Southern Buckthorn (Miss., La., Tex., Ill.); Carolina Buckthorn (N. C.); Buckthorn (S. C.); Chittimwood (Tex.); Mock Orange (Fla.).

**Bumelia angustifolia** Nutt.**Saffron Plum.**

RANGE.—Florida coast region (on the east from Indian River to southern keys, and on the west coast from Cedar Keys to Cape Romano); Texas (Rio Grande River below Laredo); Mexico (Nuevo Leon); West Indies.

NAMES IN USE.—Saffron Plum (Fla.); Downward Plum (Fla.); Ants-wood (Fla.).

**DIPHOLIS** A. de C.**Dipholis salicifolia** (Linn.) A. de C.**Bustic.**

RANGE.—Coast of southern Florida (Biscayne Bay and a number of southern keys); Bahamas and West Indies.

NAMES IN USE.—Bustic (Fla.); Cassada (Fla.).

**MIMUSOPS** Linn.**Mimusops sieberi** A. de C.**Wild Sapodilla.**

RANGE.—Off the coast of southern Florida (southern keys); Bahamas and West Indies (?).

NAMES IN USE.—Wild Dilly (Fla.); Wild Sapodilla (Fla.).

**Family EBENACEÆ.****Diospyros** Linn.

*Indian bark brown & white color mixed when cut into.* **Persimmon.**

RANGE.—Connecticut (Light-house Point, New Haven); New York (Long Island); from southern New York (east of Allegheny Mountains) to Florida (Biscayne Bay and Caloosa River); from southern Ohio to southern Alabama and west to southwestern Iowa, southern Missouri, and eastern Kansas (Franklin, Anderson, Bourbon, Crawford, and Cherokee counties), Indian Territory and Texas (Colorado River).

NAMES IN USE.—Persimmon (Conn., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ga., Fla., Miss., La., Ky., Mo., Tex., Ark., Ill., Ind., Iowa, Ohio); Date Plum (N. J., Tenn.); Plaqueminier (La.); Simon (Fla.); Possumwood (Fla.).



**Diospyros texana** Scheele.**Mexican Persimmon.**

RANGE.—Texas (Colorado and Rio Concho rivers) to Mexico (Nuevo Leon).

NAMES IN USE.—Mexican Persimmon (Tex.); Black Persimmon (Tex.); Chapote (Tex.).

## Family SYMPLOCACEÆ.

**SYMPLOCOS** Jacq.*leaf has a sweet taste***Symplocos tinctoria** (Linn.) L'Hér.**Sweetleaf.**

RANGE.—From southern Delaware (peninsula) to Florida; west in the Atlantic region to the Blue Ridge Mountains, and through the Gulf States (in Alabama up to Tennessee River) to western Louisiana and southern Arkansas (border counties).

NAMES IN USE.—Sweetleaf (Del., N. C., S. C., Fla., Ala.); Yellowwood (N. C., S. C., Ala.); Horse Sugar (Del., Ala., La.); Florida Laurel (Fla.).

## Family STYRACACEÆ.

**MOHRODENDRON** Britton.**Mohrodendron carolinum** (Linn.) Britton.**Silverbell-tree.****HALESIA TETRAPTERA** Ellis.

RANGE.—From West Virginia (mountains) to southern Illinois and south to middle Florida, northern Alabama (Lauderdale, Cullman, and Talladega counties), and Mississippi through Arkansas and western Louisiana to eastern Texas.

NAMES IN USE.—Snowdrop-tree (R. I., Pa. (cult.), N. C., S. C., Fla., La.); Silverbell-tree (R. I. (cult.), Ala., Fla., Miss.); Silverbell (Pa., cult.); Wild Olive-tree (Tenn.); Bell-tree (Tenn.); Four-winged Halesia (Ala.); Opossum-wood (Ala.); Rattlebox (Tex.); Calicewood (Tex., Ill.); Tisswood (Tenn.).

**Mohrodendron carolinum meehani** (Sarg.) nom. nov.**Meehan Silverbell-tree.**

RANGE.—Originated in the nursery of Thomas Meehan &amp; Sons, Germantown, Pa., and so far known only in cultivation.

**Mohrodendron dipterum** (Ellis) Britton.**Snowdrop-tree.****HALESIA DIPTERA** Ellis.

RANGE.—Coast region from South Carolina to northern Florida, and through the Gulf States (mainly in coast plain of Alabama) to Texas; northward through Louisiana to central Arkansas.

NAMES IN USE.—Snowdrop-tree (R. I., Del. (cult.), S. C., Ala., La., Tex.); Silverbell-tree (R. I., Del. (cult.), Miss., Tex.); Cow Licks (La.).

## Family OLEACEÆ.

**FRAXINUS** Linn.**Fraxinus cuspidata** Torr.**Fringe Ash.**

RANGE.—From southwestern Texas (canyon of Rio Grande River) through southern New Mexico to Arizona (Grand Canyon of Colorado River), and southward into Mexico (mountains of Coahuila and Nuevo Leon to Santa Eulalia Mountains in Chihuahua).

**Fraxinus greggii** Gray.**Gregg Ash.**

RANGE.—Western Texas (from mouth of San Pedro River to Pecos River) and southward into Mexico (mountains of Nuevo Leon, Coahuila, and Chihuahua).

**Fraxinus quadrangulata** Michx.**Blue Ash.**

RANGE.—From Michigan, Illinois, and Iowa southward (ranging into southeastern Kansas in Sumner and Cherokee counties; to northern Alabama (Jackson and Madison counties) and to northeastern Arkansas. Range insufficiently known.

NAME IN USE.—Blue Ash (Pa. (cult.), Ala., Ky., Mo., Ill., Mich.).

**Fraxinus nigra** Marsh.**Black Ash.**

FRAXINUS SAMBUCIFOLIA Lam.

RANGE.—From northern shores of Gulf of St. Lawrence and Newfoundland to Manitoba (Lake Winnipeg) and southward to Delaware (Newcastle County), Virginia (mountains), southern Illinois, central Missouri, and northwestern Arkansas.

NAMES IN USE.—Black Ash (Me., N. H., Vt., Mass., R. I., N. Y., N. J., Pa., Del., W. Va., Mo., Ohio, Ont., Mich., Ill., Minn.); Hoop Ash (Vt., N. Y., Del., Ohio, Ill., Ind.); Basket Ash (Mass.); Brown Ash (N. H., Tenn.); Swamp Ash (Vt., R. I., N. Y.); Water Ash (W. Va., Tenn., Ind.).

**Fraxinus anomala** Wats.**Dwarf Ash.**

RANGE.—From southwestern Colorado (McElmo River) through southern Utah; southern Nevada (Charleston Mountains).

NAMES IN USE.—Ash (Utah); Dwarf Ash (Ariz., Utah).

**Fraxinus anomala triphylla** Jones.**Trifoliate Dwarf Ash.**

RANGE.—Arizona (type locality "Pagumpa in the Grand Wash, 4,000 feet altitude").

**Fraxinus velutina** Torr.**Leatherleaf Ash.**

FRAXINUS PISTACIEFOLIA Torr.

RANGE.—From western Texas (mountains) through southern New Mexico and Arizona to southern Nevada and southeastern California (Panamint Mountains and Owens Lake).

NAME IN USE.—Ash (Tex., Ariz., Nev.).

**Fraxinus americana** Linn.**White Ash.**

RANGE.—From Nova Scotia and Newfoundland to Florida and westward to Ontario and northern Minnesota, eastern Nebraska, Kansas, Indian Territory, and Texas (Trinity River).

NAMES IN USE.—White Ash (Me., N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Del., Pa., Va., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La., Tex., Ky., Mo., Ill., Ind., Iowa, Kans., Nebr., Mich., Ohio, Ont., Minn., N. Dak., Wis.); Ash (Ark., Iowa, Wis., Ill., Mo., Minn.); American Ash (Iowa); Franc-Frene (Quebec); Cane Ash (Ala., Miss., La.).

**Fraxinus americana curtissii** (Vasey) Sudworth.**Small-fruit White Ash.**

FRAXINUS AMERICANA var. MICROCARPA Gray.

RANGE.—Northern Alabama (Morgan and Madison counties) to middle Tennessee.

**Fraxinus texensis** (Gray) Sargent.**Texas Ash.**

FRAXINUS AMERICANA var. TEXENSIS Gray.

RANGE.—Northern, central, and western Texas (from near Dallas to valley of Devils River).

NAME IN USE.—Mountain Ash (Tex.).

**Fraxinus pennsylvanica** Marsh. *twigs very pubescent.* **Red Ash.**  
**FRAXINUS PUBESCENS** Lam.

**RANGE.**—From New Brunswick to northern Florida and westward to southern Ontario. Dakota (Black Hills), eastern Nebraska, northeastern and eastern (border counties) Kansas, to west Tennessee and through northern Alabama (mountain region in St. Clair and Cullman counties).

**NAMES IN USE.**—Red Ash (Me., N. H., Vt., Mass., R. I., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Fla., Ga., Ala., Miss., La., Ky., Mo., Ill., Kans., Nebr., Mich., Minn., Ont.); Brown Ash (Me.); Black Ash (N. J.); River Ash (R. I., Ont.); Bastard Ash (Vt.); Ash (Nebr.); Piss Ash (Vt.).

**Fraxinus profunda** Bush. **Pumpkin Ash.**

**RANGE.**—Western Florida and southern Missouri (New Madrid County); Arkansas (near Varner). Range insufficiently known.

**NAME IN USE.**—Pumpkin Ash (Ark.).

**Fraxinus lanceolata** Borkh. *used in Prairie planting.* **Green Ash.**  
**FRAXINUS VIRIDIS** Michx. f.

**RANGE.**—From Vermont (Lake Champlain and southward in the Appalachian region) to northern Florida; westward to the Saskatchewan River, eastern ranges of the Rocky Mountains and extending into Utah (Wasatch Mountains) and eastern and northern Arizona (mountains), and through eastern Texas (to Colorado River).

**NAMES IN USE.**—Green Ash (Mass., R. I., Conn., N. Y., N. J., Pa., Del., N. C., S. C., Ala., Miss., La., Tex., Mo., Ill., Kans., Nebr., Mich., Minn., S. Dak., Ohio, Ont., Iowa); Blue Ash (Ark., Iowa); White Ash (Kans., Nebr.); Swamp Ash (Fla., Ala., Tex.); Ash (Ark., Iowa, Nebr.); Water Ash (Iowa).

**Fraxinus berlandieriana** A. de C. **Berlandier Ash.**

**RANGE.**—Western Texas (banks of Nueces and Rio Blanco rivers and other streams), but probably established in northeastern Mexico and in the United States only through the agency of man; indigenous in southern Mexico (mountains of Michoacan).

**Fraxinus caroliniana** Mill. **Water Ash.**

**FRAXINUS PLATYCARPA** Michx.

**RANGE.**—Coast region from southern Virginia to Florida (Cape Canaveral and Caloosa River) and in the Gulf region (in Alabama up to Tuscaloosa, Baldwin, Clark, and Mobile counties) to Texas (Sabine River); northward through western Louisiana to southwestern Arkansas.

**NAMES IN USE.**—Water Ash (N. C., S. C., Fla., Ala., Miss., La., Tex.); Carolina Ash (Pa., cult.); Poppy Ash (Ala.); Pop Ash (Fla.).

**Fraxinus oregona** Nutt. **Oregon Ash.**

**RANGE.**—From Puget Sound (shores) southward through Washington, Oregon and California (coast region to San Francisco Bay; on foothills of Sierra Nevada Mountains to mountains of San Bernardino and San Diego counties).

**NAME IN USE.**—Oregon Ash (Cal., Wash., Oreg.).

## **CHIONANTHUS** Linn.

**Chionanthus virginica** Linn. **Fringetree.**

**RANGE.**—From Pennsylvania (Lancaster and Chester counties), Delaware, West Virginia (Jackson and Summers counties), and Kentucky (Warren County) to Florida (Tampa Bay); west through the Gulf States to Texas (Brazos River) and southern Arkansas; eastern Kansas (Allen County).

**NAMES IN USE.**—Fringetree (R. I. (cult.), N. Y. (cult.), N. J., Pa., Del., D. C., N. C., S. C., Fla., Miss., La., Tex., Mo.); White Fringe

(Mass., R. I., Pa.); American Fringe (W. Va.); White Ash (W. Va.); Old Man's Beard (N. C., S. C., Ala., Fla., Miss., La.); Flowering Ash (S. C.); Sunflower-tree (Tenn.).

### OSMANTHUS Laureiro.

**Osmanthus americanus** (Linn.) Benth. & Hook. **Devilwood.**

RANGE.—Coast region from North Carolina (Cape Fear River) to Florida (Kissimmee River and Tampa Bay) and west to eastern Louisiana; Arkansas (?).

NAMES IN USE.—Devilwood (Ala., Fla.); Wild Olive (Fla.).

## Family BORRAGINACEÆ.

### CORDIA Linn.

**Cordia sebestena** Linn. **Geigertree.**

RANGE.—Southern Florida islands (Key West and other southern islands); Bahamas, West Indies, Guiana, New Granada.

NAME IN USE.—Geigertree (Fla.).

**Cordia boissieri** A. de C. **Anacahuita.**

RANGE.—From Texas (Rio Grande River) and southern New Mexico into northern Mexico.

### BOURRERIA Browne.

**Bourreria havanensis** (Roem. & Sch.) Miers. **Strongback.**

RANGE.—Florida keys (Key West, Key Largo, Upper Metacombe, and Elliotts Key); Bahamas and several of the West Indies.

NAMES IN USE.—Strongbark (Fla.); Strongback (Bahama Islands).

**Bourreria havanensis radula** (Poir.) Gray.

**Bristle-leaf Strongback.**

### EHRETIA Browne.

**Ehretia elliptica** de C. **Anaqua.**

RANGE.—Western Texas (from upper San Marcos River to the Rio Grande River); Mexico (Nuevo Leon and Coahuila to mountains of San Luis Potosi).

NAMES IN USE.—Knackaway (Tex.); Anaqua (Tex.).

## Family VERBIENACEÆ.

### CITHAREXYLUM Linn.

**Citharexylum villosum** Jacq. **Fiddlewood.**

RANGE.—Southern Florida (from Cape Canaveral to the southern keys).

NAME IN USE.—Fiddlewood (Fla.).

### AVICENNIA Linn.

**Avicennia nitida** Jacq. **Blackwood.**

RANGE.—Florida coast (from St. Augustine to the southern keys on the east coast and on the west coast from Cedar Keys to Cape Sable); Louisiana (Mississippi River delta); several of the West Indies and Brazil.

NAMES IN USE.—Blackwood (Fla.); Blacktree (Fla.); Black Mangrove (Fla.).

## Family SCROPHULARIACEÆ.

**PAULOWNIA** Sieb. & Zucc.**Paulownia tomentosa** (Thunb.) Steudel.**Paulownia.**

RANGE.—Japan. Cultivated in the Middle Atlantic and Southern States and running wild in many localities (near Wilmington, Del.; Washington, D. C.; Mobile, Ala., etc.).

## Family BIGNONIACEÆ.

**CATALPA** Scop.**Catalpa catalpa** (Linn.) Karst.**(Common) Catalpa.****CATALPA BIGNONIODES** Walt.

RANGE.—Supposed to be indigenous only in southwestern Georgia, western Florida, central Alabama and Mississippi, but widely cultivated and naturalized elsewhere east of the Rocky Mountains.

NAMES IN USE.—Catalpa (Mass., R. I., Conn., N. Y., N. J., Pa., Del., W. Va., N. C., S. C., Ala., Ga., Fla., Miss., La., Ark., Ky., Mo., Ill., Kans., Nebr., Iowa, Mich., Wis., Ohio, Minn.); Indian Bean (Mass., R. I., N. Y., N. J., Pa., N. C., Ill.); Beantree (N. J., Del., Pa., Va., La., Nebr.); Catawba (W. Va., Ala., Fla., Kans.); Cigartree (R. I., N. J., Pa., W. Va., Mo., Ill., Wis., Iowa); Catawba-tree (Del.); Indian Cigar tree (Pa.); Smoking Bean (R. I.).

**Catalpa speciosa** Warder.**Hardy Catalpa.**

RANGE.—Through southern Illinois (from the Vermilion River) and Indiana, western Kentucky and Tennessee, southeastern Missouri and northeastern Arkansas; elsewhere naturalized through cultivation, especially in southern Arkansas, western Louisiana, and eastern Texas.

NAMES IN USE.—Hardy Catalpa (Ill., Iowa, Kans., Mich., cult.); Western Catalpa (Pa. (cult.) Ohio, Kans., Nebr. (cult.) Ill.); Catalpa (R. I., N. Y. (cult.) La., Ill., Ind., Mo., Wis., Iowa, Nebr., Minn., cult.); Cigartree (Mo., Iowa, cult.); Bois Puant (La.); Indian Bean (Ind.); Shawneewood (Ind.).

**CHILOPSIS** Don.**Chilopsis linearis** (Gay.) Sweet.**Desert Willow.**

RANGE.—Through southwestern (from near Laredo) and western Texas, southern New Mexico, Arizona, southern Utah and Nevada, and southern California (San Diego County); northern Mexico.

NAMES IN USE.—Desert Willow (Cal., Tex., N. Mex., Ariz., Utah, Nev.); Texas Flowering Willow (Tex.); Flowering Willow (Tex.).

**CRESCENTIA** Linn.**Crescentia ovata** Burm.**Black Calabash.****CRESCENTIA CUCURBITINA** Linn.

RANGE.—Coast of southern Florida (Biscayne Bay, east of mouth of Miami River; also on Little River); West Indies; southern Mexico; Pacific coast of Panama; Venezuela.

NAMES IN USE.—Black Calabash-tree (Fla.); Black Calabash (Fla.).

## Family RUBIACEÆ.

**EXOSTEMA** Richard.**Exostema caribæum** (Jacq.) Roem. & Schult. **Princewood.**

RANGE.—Southern Florida keys (abundant on Key West and Upper Metacombe Key); West Indies; southern Mexico and west coast of Nicaragua.

NAME IN USE.—Princewood (Fla.).

**PINCKNEYA** Michx.**Pinckneya pubens** Michx. **Fevertree.**

RANGE.—Coast region from South Carolina to Georgia and Florida (upper Apalachicola River and tributaries in Florida and Georgia). Very rare.

NAMES IN USE.—Georgia Bark (S. C., Fla.); Fevertree (Ala.); Florida Quiline Bark (Fla.).

**GUETTARDA** Vent.**Guettarda elliptica** Swartz. **Guettarda.**

RANGE.—Southern Florida keys (near coast); Bahamas; Jamaica (coast).

NAME IN USE.—Nakedwood (Fla.).

## Family CAPRIFOLIACEÆ.

**SAMBUCUS** Linn.**Sambucus mexicana** Presl. **Mexican Elder.**

RANGE.—From western Texas (Nueces River) through southern New Mexico and Arizona to southern California; also in northern California (Plumas County); southward through Mexico to Central America.

NAMES IN USE.—Elder (N. Mex., Tex.); Elderberry-tree.

**Sambucus callicarpa** Greene. **Redberry Elder.**

RANGE.—California (coast ranges).

**Sambucus glauca** Nutt. **Pale Elder.**

RANGE.—From southern British Columbia (Fraser River) and Vancouver Island to the southern borders of California and eastward to the Blue Mountains in Oregon and the Wasatch Mountains in Utah.

NAMES IN USE.—Elder (Cal., Utah, Oreg.); Elderberry (Cal.); Black Elderberry (Utah); Mountain Elder.

**VIBURNUM** Linn.**Viburnum lentago** Linn. **Sheepberry.**

RANGE.—From Quebec (Rivière du Loup) to the Saskatchewan River and southward through the Northern States (and along the Allegheny Mountains) to northern Georgia and in western range south to southern Indiana, southwestern Missouri, and eastern Nebraska.

NAMES IN USE.—Sheepberry (Vt., N. H., Mass., R. I., Conn., N. Y., N. J., Pa., Del., S. C., Ky., Ill., Iowa, Mich., Nebr., Minn., N. Dak., Ohio);

Nannyberry (Vt., N. Y., Mich., Ohio, Ont., Iowa, Minn., N. Dak.): Nanny Plum (Vt.); Black Haw (Ill., Mo., Minn., N. Dak.); Wild Raisin (Me.); Sweetberry (Minn.); Sweet Viburnum (R. I., Tenn., Nebr.); Viburnum (R. I.).

**Viburnum prunifolium** Linn.

**Nannyberry.**

RANGE.—From Connecticut (Fairfield County and Lower Hudson River) to northern Georgia; westward through southern Michigan to eastern Kansas (border counties); Indian Territory. The southern range of this species, to which some authors unite the following species, is insufficiently known.

NAMES IN USE.—Black Haw (R. I., N. Y., N. J., Pa., Del., Va., W. Va., N. C., S. C., Ala., Ga., Fla., Miss., La., Tex., Ky., Mo., Kans., Ill., Ind., Ohio); Sloe (Tenn.); Sheepberry (N. J.); Nannyberry (N. J.); Alisier (La.); Stagbush; Haw (Md., Va.); Sweet Haw.

**Viburnum rufotomentosum** Small.

**Rusty Nannyberry.**

VIBURNUM PRUNIFOLIUM  $\beta$  FERRUGINEUM Torrey & Gray.

RANGE.—Southern Virginia to Georgia and west to western Texas. Range insufficiently known.

Evergreen  
Blue green leaves *argentea* Colla



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## Rosaceae

Fr fruit a capsule, sometimes woody, <sup>Spura</sup> <sup>Pine</sup> <sup>↑</sup> <sup>Spura</sup>  
 " " pome <sup>Pomoideae - Pomeac</sup>  
 " akene <sup>Cerocarpeae cerocarpe</sup>  
 " seed/drupe <sup>Prunioideae (drupae)</sup>  
 " many " <sup>Rosaceae Rosa</sup>

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amentaceous  
 Dioecious fl. --- Salicaceae (Willow fam) { Salix.  
 monoecious fl. Populus  
 Compound leaves Juglans.  
 Simple leaves Ricoria (Juglandaceae)  
 Fruit cone like or catkin fruit (winged) Betulaceae  
 { Betula  
 Alnus  
 Carpinus  
 Ostrya  
 Fruit a nut inclosed or subtended by dry involucre - Fagaceae  
 mostly bloom early in spring { Fagus  
 Quercus  
 Castanea  
 Castanopsis  
 Persea  
 be found in North Carolina  
 Quercus virginiana - Live oak  
 Catesbaei - Furley oak  
 bicolor - Cow oak  
 platyphloia - Swamp W. Oak  
 palustris - Pin oak  
 phellos - Willow  
 nigra - Water  
 Coastal plain  
 Marylandica & alba white  
 minor & Prinos (Cladrastis acuminata)  
 higher up



*Harry A. Wetzel*  
BULLETIN No. 10.

U. S. DEPARTMENT OF AGRICULTURE.  
DIVISION OF FORESTRY.

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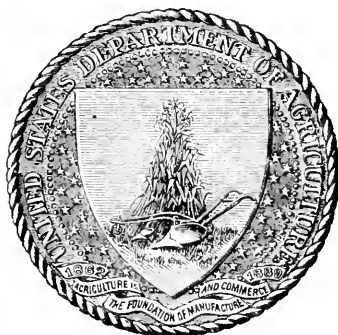
# TIMBER:

AN ELEMENTARY DISCUSSION OF THE CHARACTERISTICS  
AND PROPERTIES OF WOOD.

BY

**FILIBERT ROTH,**  
Special Agent in Charge of Timber Physics.

UNDER THE DIRECTION OF  
**B. E. FERNOW,**  
CHIEF OF THE DIVISION OF FORESTRY.



WASHINGTON:  
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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
DIVISION OF FORESTRY,  
*Washington, D. C., September 15, 1895.*

SIR: I have the honor to transmit herewith for publication a brief but comprehensive discussion of the characteristics and properties of wood in general and of our American timbers in particular, which it is hoped may be useful to engineers, architects, carpenters, lumbermen, and all wood workers. The paper was prepared by Mr. Filibert Roth, in charge of the investigations in timber physics.

Although much of the information contained in this bulletin exists in the experience of practical woodworkers and in books in other languages, it has never before been published in English in systematic and accessible form and with special application to American timbers.

Such a publication can not, of course, exhaust any part of this great subject. It is desired that it may be followed by a more elaborate treatise when additional knowledge has been gained through the investigations now in progress. The information it contains is largely based on actual experiment and scientific observation, and will, it is hoped, not only explain the experiences of the practical worker with his material, but will remove erroneous notions, and thus aid in improving the practice and lead to a more rational use of our forest resources.

Respectfully,

B. E. FERNOW,  
*Chief of Division of Forestry,*

Hon. J. STERLING MORTON,

*Secretary.*

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## INTRODUCTION.

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Wood is now, has ever been, and will continue to be, the most widely useful material of construction. It has been at the base of all material civilization. In spite of all the substitutes for it in the shape of metal, stone, and other materials, the consumption of wood in civilized countries has never decreased; nay, applications in new directions have increased its use beyond the saving effected by the substitutes. Thus, in England, the per capita consumption has increased in the last fifty years more than double, a fact which is especially notable, as the bulk of the timber used there must be imported, while iron and coal are plentiful in Great Britain.

In the United States we can only estimate from the partial data furnished by census returns. By these we find the per capita consumption to have increased for every decade since 1860 at the rate of from 20 to 25 per cent.

Although wood has been in use so long and so universally, there still exists a remarkable lack of knowledge regarding its nature in detail, not only among laymen, but among those who might be expected to know its properties. As a consequence, the practice is often faulty and wasteful in the manner of its use. Experience has been almost the only teacher, and notions—sometimes right, sometimes wrong—rather than well-substantiated facts lead the wood consumer. Iron, steel, and other metals are much better known in regard to their properties than wood. The reason for this imperfect knowledge lies in the fact that wood is not a homogeneous material, like the metals, but a complicated structure, and so variable that one stick will behave very differently from another stick, although cut from the same tree. Not only does the wood of one species differ from that of another, but the butt cut differs from the top log; the heartwood from the sapwood; the wood of the quickly grown sapling of the abandoned field from that of the slowly grown old monarch of the forest. Even the manner in which the tree was sawed and the condition in which the wood was cut and kept influence its behavior and quality. It is, therefore, extremely difficult to study the material for the purpose of establishing general laws, and it becomes necessary to make a specific inspection of the individual stick which is to be applied to a certain purpose. The selection, not only of the most suitable kinds, but of each stick, for the

purpose for which it is fit will enter into that improved practice to which we may look both for greater economy and greater efficiency.

The object of this bulletin is to record more systematically than has been done hitherto the knowledge which exists and which will help the wood consumer in the choice of his material and in determining whether, and if so why, a given stick will answer his purpose. Such inspection requires, first, a knowledge of the gross structure and appearance, which give indications of quality and behavior, and then, for finer application, a knowledge of the minute anatomical or microscopic structure. The minute structure will often explain the difference in behavior of various kinds of wood, and a knowledge of it is almost indispensable in distinguishing the various kinds.

In the countries of Europe the kinds of wood used in construction and manufacture are so few that there is but little difficulty in distinguishing them. In our own country the great variety of woods, and of useful woods at that, often makes the mere distinction of the kind or species of tree most difficult. Thus there are at least eight pines (of the thirty-five native ones) in the market, some of which so closely resemble each other in their minute structure that they can hardly be told apart; and yet they differ in quality and should be used separately, although they are often mixed or confounded in the trade. Of the thirty-six oaks, of which probably not less than six or eight are marketed, we can readily recognize by means of their minute anatomy at least two tribes—the white and the black oaks. The distinction of the species is, however, as yet uncertain. The same is true as to the eight kinds of hickory, the six kinds of ash, etc. Before we shall be able to distinguish the wood of these species unfailingly, more study will be necessary. The key given in the present publication, therefore, is by necessity only provisional, requiring further elaboration. It unfortunately had to be based largely on external appearances, which are not always reliable. Sometimes, for general practical purposes, this mere appearance, with some minor attributes, such as color, taste, etc., are together sufficient, especially when the locality is known from which the species came, and in the log pile the determination may by these means be rendered possible when a single detached piece will leave us doubtful as to the species. In the market the distinctions are often most uncertain, and a promiscuous application of names adds to the confusion. To be sure, there is not much virtue in knowing the correct name, except that it assists us in describing the exact kind of material we desire to obtain. Nor is there always much gained in being able to identify the species of wood, but that it predicates certain qualities which are usually found in the species.

In selecting material, then, for special purposes we first determine what species to use as having either one quality which is foremost in our requirements, or several qualities in combination, as shown by actual experience or by experiment.

The uses of the various woods depend on a variety of conditions. The carpenter and builder, using large quantities of material and bestowing a minimum amount of labor on the greater part of the same, uses those kinds which are abundant, and hence cheap, to be had in large dimensions, light to ship, soft to work and to nail, and fairly stiff and insect proof—a combination represented in the conifers. They need not be handsome, hard, tough, or very strong, and may shrink even after they are in place. When it comes to finishing-woods, more stress is laid on color and grain and that the wood shall shrink as little as possible.

The furniture maker, who bestows a maximum amount of work on his material, needs a wood that combines strength, and sometimes toughness, with beauty and hardness, that takes a good polish, keeps joint, and does not easily indent. It must not warp or shrink when once in place, but it need not be light or soft or insect proof or abundant in any one kind, and in large dimensions, nor yet particularly cheap.

Toughness, strength, and hardness combined are sought by the wagon maker. The carriage builder, cooper, and shingle maker look for straight-grained, easy-splitting woods, and for a long fiber, the absence of disturbing resinous and coloring matter, knots, etc. Durability under exposure to the weather, resistance to indentation, and the holding of spikes are required for a good railroad tie; lasting qualities, elasticity, and proportionate dimensions of length and diameter, for telegraph poles.

Sometimes in practice it is immaterial whether the stick be of white oak or red oak, and many wood yards make no distinction, in fact do not know any, but the experienced cooper will quickly distinguish, not by name, perhaps, but by quality, the more porous red or black oak from the less porous white species. On the other hand, the very same white oak—*Quercus alba*, usually a superior article—may furnish so poor material for a handle or a plow beam that a stick of red oak would be preferable. The inspection, then, must be made not only for the species but for the quality, with reference to the purpose for which the stick is to be used.

That the inspection should have regard to defects and unhealthy condition (often indicated by color) goes without saying, and such inspection is usually practiced. That knots, even the smallest, are defects which for some uses condemn the material altogether needs hardly to be mentioned, but that season checks, even those that have closed by subsequent shrinkage, remain elements of weakness is not so readily appreciated. Yet there can not be any doubt of this, since the intimate connection of the wood fibers, once interrupted, is never reestablished. The careful wood user, therefore, is concerned as to the manner in which his material was treated after the felling, for according to the more or less careful seasoning of it the season checks, not altogether avoidable, are more or less abundant. This is practically

recognized by splitting wagon and cooperage stock in the woods and seasoning it partly shaped, and also in making a distinction, often unnecessarily, between air-dried and kiln-dried material.

Where strength is required, the weight of the material will give good indications, for it is now pretty well established that weight and strength go more or less together. But since weight in the green wood is made up of at least three elements, namely, that of the wood fiber itself, that of the water in the cell spaces, and that of the water in the cell walls, the weight is deceptive unless we know also the moisture condition of the stick or else ascertain the specific weight of the dry wood. That the moisture contents influence considerably the strength of the material is now well proven, strength increasing with loss of moisture, and hence in practice allowance should be made according to whether the stick is to be used where it will be exposed to the weather or under cover and painted.

In some woods like the pines and the "ring porous" woods, such as oak, chestnut, and hickory, in which each annual layer or ring is made up of two distinct parts, the loose, porous spring wood and the dense and firm summer wood, the proportion of the latter per square inch of cross section—usually but not always depending on the width of the ring—furnishes a more direct criterion than the weight alone. The color effect of itself gives indications of the weight, since both weight and color effect depend on the same feature, namely, quantity of material; hence the larger quantity of dense summer wood on the cross section occasions darker color, which is usually indicative of strength. Color, too, must be consulted to detect incipient decay. Again, the difference in firmness and hardness of the summer wood itself, as tested by the knife or recognized in the difference of color effect by the practiced eye, furnishes another criterion in the selection of the stick.

Lastly, the manner in which the stick is sawed from the tree has a remarkable influence upon its qualities and behavior, and it should, therefore, either be specially sawed or selected with a view to its character and to the purpose for which it is to be used. This is a matter fully appreciated among only a few wood users, like the wheelwrights, piano makers, etc., but it needs to be observed much more than it is, even in building. Quarter or rift sawing, i. e., cutting sticks or boards out of the log in such a manner that the annual rings are cut through as nearly as possible radially, has lately been practiced largely for the sake of the beauty of the even grain thus obtained, and also for flooring on account of the better wear which the even exposure of the grain (hard bands of summer wood on edge) secures; but it should be much more widely applied to secure greater strength and more uniform seasoning and thus to reduce to some extent the one drawback to wood as a material of construction, that is, its liability to "working" (shrinking and swelling). The reason for the superiority of quarter-sawed pieces, as well as the general fact that the manner of sawing



out a stick affects the general character and behavior of the same, will appear from the following considerations :

A square column or beam cut so as to contain the heart or pith of the tree in its center—which, by the way, is the weakest part on

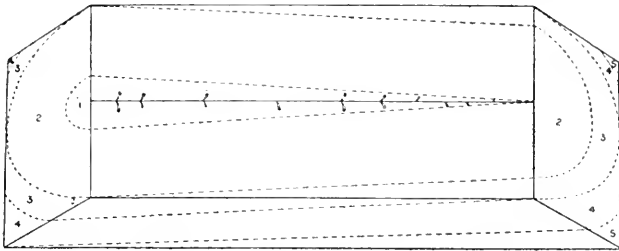


FIG. 1.—A piece of sawn timber cut through along the pith, illustrating its structural aggregates.

account of the many knots which it invariably and necessarily contains—consists in the main of five structural aggregates (see fig. 1), namely: (1) In the center a cone of wood fibers with the base in the butt end and the apex in the top end, the base representing the rings of as many years as it took the tree to attain the height of the column; none of the fibers belonging to these rings appear in the top section excepting those of the last ring which forms the apex of the cone; (2) a hollow cylinder of material surrounding the cone, all fibers of which are found in both sections and continuously through the whole length of the column; all the entire rings at the bottom belong in this cylinder, and undoubtedly form the strongest part of the column; (3) surrounding this cylinder a partial cylindrical envelope of wood fibers, all of which are represented in the top section, but only a part appear at the corners of the bottom; most of them, therefore, do not run through the whole length, but are cut through at varying lengths, thereby presenting the “bastard faces” on the sides of the column; (4) a partial envelope whose radial extent is limited by the corners of the basal section, imperfect at both ends; (5) the corners at the top, three-sided pyramids with the base in the top section, the fibers running out at varying lengths.

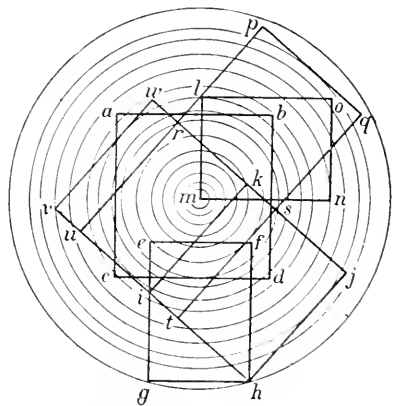


FIG. 2.—Possibilities of cutting timber from a log with reference to position of grain.

Now, it will be readily admitted that each of these “structural aggregates” has a different value in the combined strength of the whole. If the stick be cut with the center or pith in one side (see fig. 2) all these aggregates will be halved; if the stick be cut out differently, for instance, with the heart entirely out or if it be made longer or

shorter, or rectangular instead of square, in each case the proportion of each of the aggregates changes, and hence it stands to reason that the strength of the column, or beam, or stick, changes according to the manner in which it is cut from the tree. This most evident and important fact has, it seems, escaped our best engineers and experimenters, who have tested beams without taking account of this disturbing element, and it is certainly overlooked most generally by builders and carpenters in their selection of material.

While it may perhaps not be expected that the sawing at the mill will be done with more care so as to secure the best results in application, or that the special advantage of quarter sawing will soon be sufficiently appreciated so as to extend its use in such a manner that the greater efficiency of the quarter sawed material will compensate for the greater expense of the operation, wood users may at least be expected to make their selections from the sawed material in the yard, and shape it for their particular use with greater care.

There is no country in which wood is more lavishly used than in the United States, and none in which nature has more bountifully provided for all reasonable requirements. In the absence of proper efforts to secure reproduction, the most valuable kinds are rapidly being decimated, and the necessity of a more rational and careful use of what remains is clearly apparent. By greater care in selection, however, not only can the duration of the supply be extended, but more satisfactory results will accrue from its use.

B. E. FERNOW.

WASHINGTON, D. C., *September 15, 1895.*

# TIMBER.

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## CHARACTERISTICS AND PROPERTIES OF WOOD.

### I.—STRUCTURE AND APPEARANCE.

The structure of wood affords the only reliable means of distinguishing the different kinds. Color, weight, smell, and other appearances, which are often direct or indirect results of structure, may be helpful in this distinction but can not be relied upon entirely. In addition, structure underlies nearly all the technical properties of this important product and furnishes an explanation why one piece differs as to these properties from another.

Structure explains why oak is heavier, stronger, and tougher than pine; why it is harder to saw and plane, and why it is so much more difficult to season without injury. From its less porous structure alone, it is evident that a piece of a young and thrifty oak is stronger than the porous wood of an old or stunted tree; or that Georgia or longleaf pine excels white pine in weight and strength. Keeping especially in mind the arrangement and direction of the fibers of wood, it is clear at once why knots and "crossgrains" interfere with the strength of timber.

It is due to structural peculiarities that "honeycombing" occurs in rapid seasoning, that "checks" or cracks extend radially and follow pith rays, that tangent or "bastard" boards shrink and warp more than quartered lumber. These same peculiarities enable cherry and oak to take a better finish than basswood or coarse grained pine.

Moreover, structure, aided by color, determines the beauty of wood. All the pleasing figures, whether in a hard-pine ceiling, a desk of quartered oak, or in the beautiful panels of "curly" or "bird's-eye" maple decorating the saloon of a ship or a palace car, are due to differences in the structure of the wood. Knowing this, the appearance of any particular section can be foretold, and almost unlimited choice and combination are thereby suggested.

Thus a knowledge of structure not only enables us to distinguish the different woods, judge as to their qualities, and explain the causes of their beauty, but it also becomes an invaluable aid to the thoughtful worker, guiding him to a more careful selection and a more perfect use of his material.

### CLASSES OF TREES.

The timber of the United States is furnished by three well-defined classes of trees: the needle-leaved, naked-seeded conifers (pine, cedar, etc.), the dicotyledonous (with two seed leaves), broad-leaved trees (oak,

poplar, etc.), and to an inferior extent by the monocotyledonous (with one seed leaf), palms, yuccas, and their allies, which last are confined to the most southern parts of the country.

Broad-leaved trees are also known as deciduous trees, although especially in warm countries, many of them are evergreen,<sup>1</sup> while the conifers are commonly termed "evergreens," although the larch, bald cypress, and others shed their leaves every fall, and even the names "broad-leaved" and "coniferous," though perhaps the most satisfactory, are not at all exact, for the conifer ginkgo has broad leaves and bears no cones.

In the lumber trade, the woods of broad-leaved trees are known as "hardwoods," though poplar is as soft as pine, and the coniferous woods are "soft woods," notwithstanding that yew ranks high in hardness even when compared to "hardwoods."

Both in the number of different kinds of trees or species and still more in the importance of their product the conifers and broad-leaved trees far excel the palms and their relatives.

In the manner of growth both conifers and broad-leaved trees behave alike, adding each year a new layer of wood which covers the old wood in all parts of the stem and limbs. Thus the trunk continues to grow in thickness throughout the life of the tree by additions (annual rings) which in temperate climates are, barring accidents, accurate records of the tree. With the palms and their relatives the stem remains generally of the same diameter, the tree of a hundred years being as thick as it was at ten years, the growth of these being only at the top. Even where a peripheral increase takes place, as in the yuccas, the wood is not laid on in well-defined layers; the structure remains irregular throughout.

Though alike in their manner of growth, and therefore similar in their general make-up, conifers and broad-leaved trees differ markedly in the details of their structure and the character of their wood. The wood of all conifers is very simple in its structure, the fibers composing the main part of the wood being all alike and their arrangement regular. The wood of broad-leaved trees is complex in structure; it is made up of several different kinds of cells and fibers and lacks the regularity of arrangement so noticeable in the conifers. This difference is so great that in a study of wood structure it is best to consider the two kinds separately.

#### WOOD OF CONIFEROUS TREES.

Examining a smooth cross section or end face of a well-grown log of Georgia pine or Norway pine, we distinguish an envelope of reddish, scaly bark, a small whitish pith at the center, and between these the wood in a great number of concentric rings.

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<sup>1</sup> In Ceylon even the cultivated cherry has become an evergreen.

## BARK AND PITH.

The bark of a pine stem is thickest and roughest near the base, decreases rapidly in thickness from  $1\frac{1}{2}$  inches at the stump to one-tenth inch near the top of the tree, and forms in general about 10 to 15 per cent of the entire trunk.

The pith is quite thick, usually one-eighth to one-fifth inch in Norway pine and in the southern species, though much less so in white pine, and is very thin, one-fifteenth to one twenty-fifth inch in cypress, cedar, and larch.

In woods with a thick pith, this latter is finest at the stump, grows rapidly thicker upward, and becomes thinner again in the crown and limbs, the first 1 to 5 rings adjoining it behaving similarly.

## SAP AND HEART WOOD.

A zone of wood next to the bark, 1 to 3 or more inches wide, and containing 30 to 50 or more annual rings, is of lighter color; this is the sapwood, the inner, darker part of the log being the heartwood. In the former many cells are active and store up starch and otherwise assist in the life processes of the tree, although only the last or outer layer of cells the cambium, forms the growing part and the true life of the tree. In the heartwood all cells are lifeless cases, and serve only the mechanical function of keeping the tree from breaking under its own great weight, or from being laid low by the winds.

The darker color of the heartwood is due to infiltration of chemical substances into the cell walls, but the cavities of the cells in pine are not filled up, as is sometimes believed, nor do their walls grow thicker, nor is their wall any more lignified than in the sapwood. Sapwood varies in width and in the number of rings which it contains, even in different parts of the same tree; the same year's growth which is sapwood in one part of a disk may be heartwood in another. Sapwood is widest in the main part of the stem and varies often within considerable limits, and without apparent regularity. Generally it becomes narrower toward the top and in the limbs, its width varying with the diameter, and being least, in a given disk, on the side which has the shortest radius. Sapwood of old and stunted pines is composed of more rings than that of young and thrifty specimens. Thus in a pine 250 years old, a layer of wood or annual ring does not change from sapwood to heartwood until seventy or eighty years after it is formed, while in a tree 100 years old, or less, it remains sapwood only from thirty to sixty years. The width of the sapwood varies considerably for different kinds of pines; it is small for longleaf and white pine, and great for loblolly and Norway pines. Occupying the peripheral part of the trunk the proportion which it forms of the entire mass of the stem is always great. Thus even in old trees of longleaf pine the sapwood forms about 40 per cent of the merchantable log, while in the loblolly and in all young trees the bulk of the wood is sapwood.

## THE ANNUAL OR YEARLY RING.

The concentric, annual, or yearly rings, which appear on the end face of a log are cross sections of so many thin layers of wood. Each such layer forms an envelope around its inner neighbor, and is in turn covered by the adjoining layer without, so that the whole stem is built up of a series of thin hollow cylinders, or rather cones. A new layer of wood is formed each season, covering the entire stem, as well as all the living branches. The thickness of this layer, or the width of the yearly ring, varies greatly in different trees and also in different parts of the same tree. In a normally grown, thrifty pine log the rings are widest near the pith, growing more and more narrow toward the bark. Thus the central 20 rings in a disk of an old longleaf pine may each be one eighth to one-sixth inch (3 to 4 mm.) wide, while the 20 rings next to the bark may average only one-thirtieth inch (0.7 mm.). In our forest trees rings of one-half inch in width occur only near the center in disks of very thrifty trees of both conifers and hard woods; one-twelfth inch represents good thrifty growth, and the minimum width of about one two hundredths inch (0.2 mm.) is often seen in stunted spruce and pine. The average width of rings in well-grown old white pine will vary from one-twelfth to one-eighteenth inch, while in the slower growing longleaf pine it may be one twenty-fifth to one-thirtieth of an inch. The same layer of wood is widest near the stump in very thrifty young trees, especially if grown in the open park, but in old forest trees the same year's growth is wider in the upper part of the tree, being narrowest near the stump and often also near the very tip of the stem. Generally the rings are widest near the center, growing narrower towards bark. In logs from stunted trees the order is often reversed, the interior rings being thin and the outer rings widest. Frequently, too, zones or bands of very narrow rings, representing unfavorable periods of growth, disturb the general regularity. Few trees, even among pines, furnish a log with truly circular cross section; usually it is an oval, and at the stump commonly quite an irregular figure. Moreover, even in very regular or circular disks the pith is rarely in the center, and frequently one radius is conspicuously longer than its opposite, the width of some of the rings, if not all, being greater on one side than on the other. This is nearly always so in the limbs, the lower radius exceeding the upper.

In extreme cases, especially in the limbs, a ring is frequently conspicuous on one side and almost or entirely lost to view on the other. Where the rings are extremely narrow, the dark portion of ring is often wanting, the color being quite uniform and light. The greater regularity or irregularity of the annual rings has much to do with the technical qualities of the timber.

## SPRING AND SUMMER WOOD.

Examining the rings more closely, it is noticed that each ring is made up of an inner, softer, light-colored, and an outer, or peripheral, firmer and darker-colored portion. Being formed in the fore part of the season, the inner, light-colored part is termed spring wood, the outer, darker portion being the summer wood of the ring. Since the latter is very heavy and firm, it determines to a large extent the weight and strength of the wood, and as its darker color influences the shade of color of the entire piece of wood, this color effect becomes a valuable aid in distinguishing heavy and strong from light and soft pine wood. In most hard pines, like the longleaf, the dark summer wood appears as a distinct band, so that the yearly ring is composed of two sharply defined bands—an inner, the spring wood, and an outer, the summer wood. But in some cases, even in hard pines, and normally in the wood of white pines, the spring wood passes gradually into the darker summer wood, so that a sharply defined line occurs only where the spring wood of one ring abuts against the summer wood of its neighbor. It is this clearly defined line which enables the eye to distinguish even the very narrow rings in old pines and spruces. In some cases, especially in the trunks of Southern pines, and normally on the lower side of pine limbs, there occur

dark bands of wood in the spring wood portion of the ring, giving rise to false rings which mislead in a superficial counting of rings. In the disks cut from limbs these dark bands often occupy the greater part of the ring and appear as "lunes" or sickle-shaped figures. The wood of these dark bands is similar to that of the true summer wood—the cells have thick walls, but usually lack the compressed or flattened form.

Normally, the summer wood forms a greater proportion of the ring in the part of the tree formed during the period of thriftiest growth. In an old tree this proportion is very small in the first 2 to 5 rings about the pith, and also in the part next to the bark, the intermediate part showing a greater proportion of summer wood. It is also greatest in a disk taken from near the stump and decreases upward in the stem,

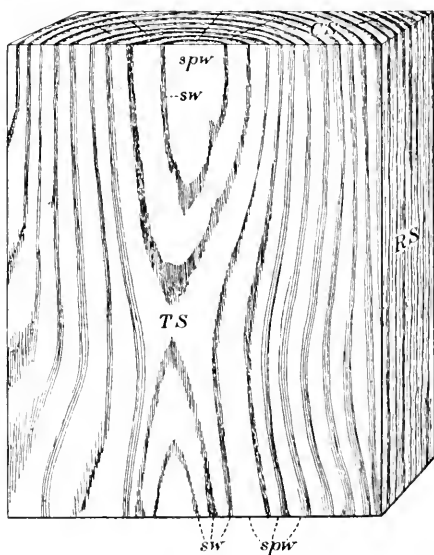


FIG. 3.—Board of pine. CS, cross section; RS, radial section; TS, tangential section; *sw*, summer wood; *spw*, spring wood.

thus fully accounting for the difference in weight and firmness of the wood of these different parts. In the longleaf pine the summer wood often forms scarcely 10 per cent of the wood in the central 5 rings; 40 to 50 per cent of the next 100 rings; about 30 per cent in the next 50, and only about 20 per cent in the 50 rings next to the bark. It averages 45 per cent of the wood of the stump and only 24 per cent of that of the top.

Sawing the log into boards, the yearly rings are represented on the board faces of the middle board (radial sections) by narrow, parallel stripes (see fig. 3), an inner, lighter stripe, and its outer, darker neighbor always corresponding to one annual ring.

On the faces of the boards nearest the slab (tangential or "bastard" boards) the several years' growth should also appear as parallel, but much broader stripes. This they do

only if the log is short and very perfect. Usually a variety of pleasing patterns is displayed on the boards, depending on the position of the saw cut, and on the regularity of growth of the log. (See fig. 3.)

Where the cut passes through a prominence (bump or crook) of the log, irregular, concentric circlelets and ovals are produced, and on almost all tangent boards, arrow, or V-shaped forms occur.

#### ANATOMICAL STRUCTURE.

Holding a well-smoothed disk, or cross section one-eighth inch thick toward the light, it is readily seen that

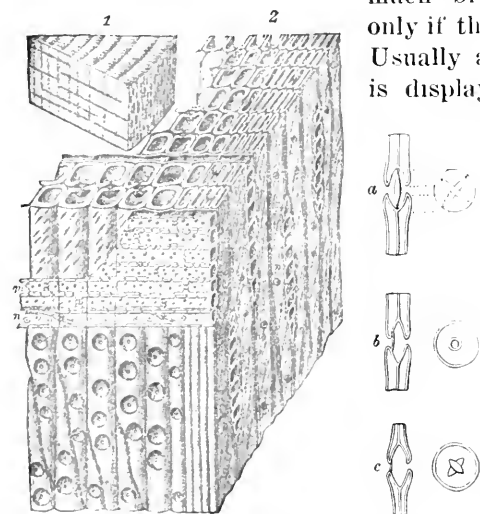


FIG. 4.—Wood of spruce. 1, natural size; 2, small part of one ring magnified 100 times. The vertical tubes are wood fibers in this case all "tracheids." *m*, medullary or pith ray; *n*, transverse tracheids of pith ray; *a*, *b*, and *c*, bordered pits of the tracheids, more enlarged.

pine wood is a very porous structure. If viewed with a strong magnifier, the little tubes, especially in the spring wood of the rings, are easily distinguished and their arrangement in regular straight radial rows is apparent. Scattered through the summer wood portion of the rings, numerous irregular grayish dots (the resin ducts) disturb the uniformity and regularity of the structure. Magnified 100 times, a piece of spruce, which is similar to pine, presents a picture like that shown in fig. 4. Only short pieces of the tubes or cells of which the wood is composed are represented in the picture.

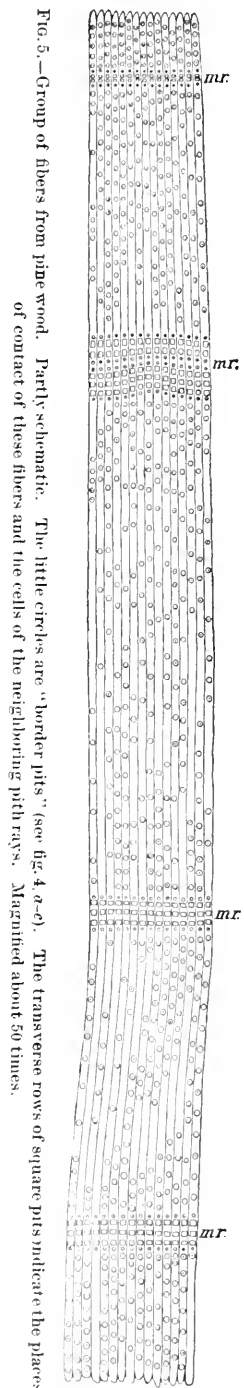
The total length of these fibers is one-twentieth to one-fifth inch, being smallest near the pith, and is 50 to 100 times as great as their



width (fig. 5). They are tapered and closed at their ends, polygonal, or rounded and thin walled, with large cavity, lumen or internal space in the spring wood, thick walled and flattened radially with the internal space or lumen much reduced in the summer wood. (See right-hand portion of fig. 4). This flattening, together with the thicker walls of the cells which reduces the lumen, causes the greater firmness and darker color of the summer wood—there is more material in the same volume. As shown in the figure, the tubes, cells, or “tracheids” are decorated on their walls by circling-like structures, the “bordered pits,” sections of which are seen more magnified at *a*, *b*, and *c*, fig. 4. These pits are in the nature of pores, covered by very thin membranes, and serve as waterways between the cells or tracheids.

The dark lines on the side of the smaller piece (1, fig. 4) appear when magnified (in 2, fig. 4) as tiers of 8 to 10 rows of cells, which run radially (parallel to the rows of tubes or tracheids) and are seen as bands on the radial face and as rows of pores on the tangential face. These bands or tiers of cell rows are the medullary rays or pith rays, and are common to all our lumber woods. In the pines and other conifers they are quite small, but they can readily be seen, even without a magnifier, if a radial surface of split wood (not smoothed) is examined. The entire radial face will be seen almost covered with these tiny structures, which appear as fine but conspicuous cross lines. As shown in fig. 4 the cells of the medullary or pith rays are smaller and very much shorter than the wood fibers or tracheids and their long axis is at right angles to that of the fibers. In pines and spruces the cells of the upper and lower rows of each tier or pith ray have “bordered” pits like those of the wood fibers or tracheids proper, but the cells of the intermediate rows, and of all rows in the rays of cedars, etc., have only “simple” pits, i. e., pits devoid of the saucer-like “border” or rim.

In pine, many of the pith rays are larger than the majority, each containing a whitish line, the horizontal resin duct, which, though much smaller, resembles the vertical ducts seen on the cross section. The larger vertical resin ducts are best observed on



removal of the bark from a fresh piece of white pine, cut in winter, where they appear as conspicuous white lines, extending often for many inches up and down the stem.

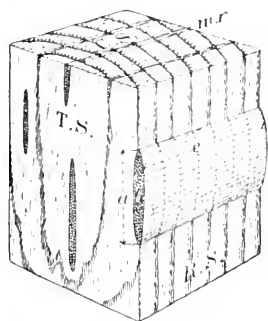


FIG. 6.—Block of oak. *C. S.*, cross section; *R. S.*, radial section; *T. S.*, tangential section; *m. r.*, medullary or pith ray; *a*, height, *b*, width, and *c*, length of a pith ray.

Neither the horizontal nor the vertical resin ducts are vessels or cells, but are openings between cells, i. e., intercellular spaces, in which the resin accumulates, freely oozing out when the ducts of a fresh piece of sapwood are cut. They are present only in our coniferous woods, and even here they are restricted to pine, spruce, and larch, and are normally absent in fir, cedar, cypress, and yew.

Altogether the structure of coniferous wood is very simple and regular, the bulk being made up of the small fibers called tracheids, the disturbing elements of pith rays and resin ducts being insignificant, and hence the great uniformity and great technical value of coniferous wood.

#### WOOD OF BROAD-LEAVED TREES.

On a cross section of oak, the same arrangement of pith and bark, of sapwood and heartwood, and the same disposition of the wood in well-defined concentric or annual rings occurs, but the rings are marked by lines, or rows, of conspicuous pores or openings which occupy the greater part of the spring wood of each ring (see fig. 6, also fig. 8) and are, in fact, the hollows of vessels through which the cut has been made. On the radial section, or quarter-sawed board, the several layers appear as so many parallel stripes (see fig. 7); on the tangential section or “bastard” face, patterns similar to those mentioned for pine wood are observed. But while the patterns in hard pine are marked by the darker summer wood and are composed of plain, alternating stripes of darker and lighter wood, the figures in oak (and other broad-leaved woods) are due chiefly to the vessels,

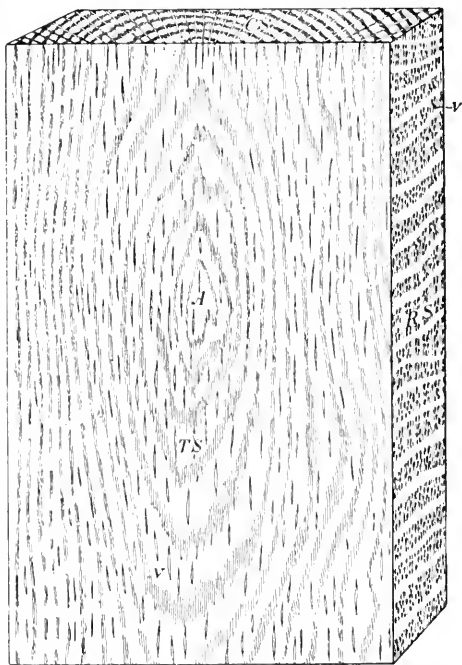


FIG. 7.—Board of oak. *C. S.*, cross section; *R. S.*, radial section; *T. S.*, tangential section; *v*, vessels or pores, cut through. *A*, slight curve in log which appears in section as an islet.

those of the spring wood in oak being the most conspicuous (see fig. 7); so that in an oak table the darker, shaded parts are the spring wood, the lighter, unicolored parts the summer wood.

On closer examination of the smoothed cross section of oak, the spring wood part of the ring is found to be formed, in great part, of pores: large, round, or oval openings made by the cut through long

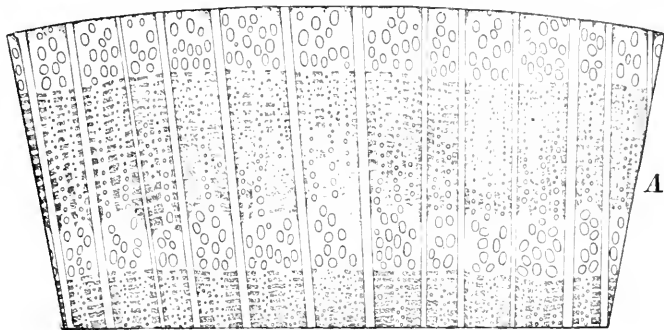


FIG. 8 A.—Cross section of oak magnified about 5 times.

vessels. These are separated by a grayish and quite porous tissue (see fig. 8 A), which continues here and there in the form of radial, often branched, patches (not the pith rays) into and through the summer wood to the spring wood of the next ring. The large vessels of the spring wood, occupying 6 to 10 per cent of the volume of a log in very good oak, and 25 per cent or more in inferior and narrow-ringed lumber, are a very important feature, since it is evident that the greater their share in the volume, the lighter and weaker the wood. They are smallest near the pith, and grow wider outward; they are wider in the stem than limb and seem to be of indefinite length, forming open channels in some cases probably as long as the tree itself.

Scattered through the radiating gray patches of porous wood are vessels similar to those of the spring wood, but decidedly smaller. These vessels are usually fewer and larger near the spring wood, and smaller and more numerous in the outer portions of the ring. Their number and size can be utilized to distinguish the oaks classed as white oaks from those classed as black and red oaks; they are fewer and larger in red oaks, smaller but much more numerous in white oaks. The summer wood, except for these radial grayish patches, is dark colored and firm. This firm portion, divided into bodies or strands by these patches of porous wood

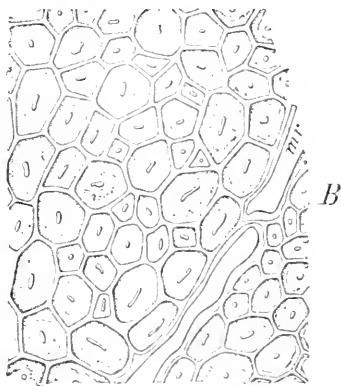


FIG. 8 B.—Portion of the firm bodies of fibers with two cells of a small pith ray *etc.* Highly magnified.

and also by fine wavy concentric lines of short, thin-walled cells (see fig. 8 A), consists of thick-walled fibers (see fig. 8 B) and is the chief element of strength in oak wood. In good white oak it forms one-half and more of the wood; it cuts like horn, and the cut surface is shiny and of a deep chocolate-brown color. In very narrow-ringed wood and in inferior red oak it is usually much reduced in quantity as well as quality.

The pith rays of the oak, unlike those of coniferous woods, are at least in part very large and conspicuous (see fig. 6, their height indicated by the letter *a*, and their width by the letter *b*). The large medullary rays of oak are often twenty and more cells wide and several hundred cell rows in height, which amount commonly to one or more inches. These large rays are conspicuous on all sections. They appear as long, sharp, grayish lines on the cross section, as short, thick lines, tapering at each end, on the tangential or "bastard" face, and as broad, shiny bands, the "mirrors," on the radial section. In addition to these coarse rays, there is also a large number of small pith rays, which can be seen only when magnified. On the whole, the pith rays form a much larger part of the wood than might be supposed. In specimens of good white oak it has been found that they formed about 16 to 25 per cent of the wood.

#### MINUTE STRUCTURE.

If a well-smoothed, thin disk, or cross section of oak (say one-sixteenth inch thick) is held up to the light, it looks very much like a sieve, the pores or vessels appearing as clean-cut holes; the spring wood and gray patches are seen to be quite porous, but the firm bodies of fibers between them are dense and opaque. Examined with the magnifier it will be noticed that there is no such regularity of arrangement in straight rows as is conspicuous in the pine; on the contrary, great irregularity prevails. At the same time, while the pores are as large as pin holes, the cells of the denser wood, unlike those of pine wood,

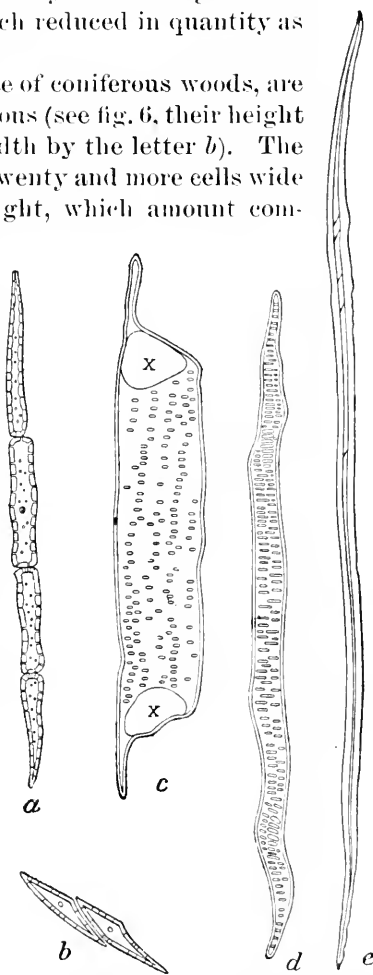


FIG. 9.—Isolated fibers and cells. *a*, four cells of wood parenchyma; *b*, two cells from a pith ray; *c*, a single joint or cell of a vessel, the openings *x* leading into its upper and lower neighbors; *d*, tracheid; *e*, wood fiber proper.

are too small to be distinguished. Studied with the microscope, each vessel is found to be a vertical row of a great number of short, wide tubes, joined end to end (fig. 9, *c*). The porous spring wood and radial gray tracts are partly composed of smaller vessels, but chiefly of tracheids like those of pine, and of shorter cells, the "wood parenchyma," resembling the cells of the medullary rays. These latter, as well as the fine concentric lines mentioned as occurring in the summer wood, are composed entirely of short, tube-like parenchyma cells with square or oblique ends (fig. 9, *a* and *b*). The wood fibers proper, which form the dark, firm bodies referred to, are very fine, thread-like cells one twenty-fifth to one-tenth inch long, with a wall commonly so thick that scarcely any empty internal space or lumen remains (figs. 9, *e*, and 8, *B*).

If instead of oak a piece of poplar or basswood (fig. 10) had been used in this study, the structure would have been found to be quite different. The same kinds of cell-elements, vessels, etc., are, to be



FIG. 10.—Cross section of basswood (magnified). *v*, vessels; *mr*, pith rays.

sure, present, but their combination and arrangement is different, and thus from the great variety of possible combinations results the great variety of structure and, in consequence, of the qualities which distinguish the wood of broad-leaved trees. The sharp distinction of sapwood and heartwood is wanting; the rings are not so clearly defined, the vessels of the wood are small, very numerous, and rather evenly scattered through the wood of the annual ring, so that the distinction of the ring almost vanishes and the medullary or pith rays, in poplar, can be seen, without being magnified, only on the radial section.

#### DIFFERENT GRAIN OF WOOD.

The terms "fine grained," "coarse grained," "straight grained" and "cross grained" are frequently applied in woodworking. In common usage, wood is "coarse grained" if its annual rings are wide, "fine grained" if they are narrow; in the finer wood industries a "fine-grained" wood is capable of high polish while a "coarse-grained" wood

is not, so that in this latter case the distinction depends chiefly on hardness, and in the former on an accidental case of slow or rapid growth.

Generally the direction of the wood fibers is parallel to the axis of the stem or limb in which they occur, the wood is straight grained, but

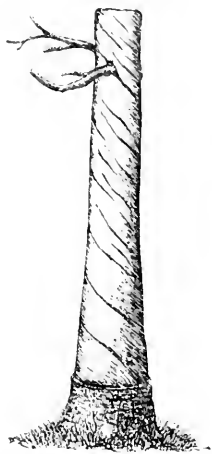


FIG. 11.—Spiral grain. Season checks, after removal of bark, indicate the direction of the fibers or grain.

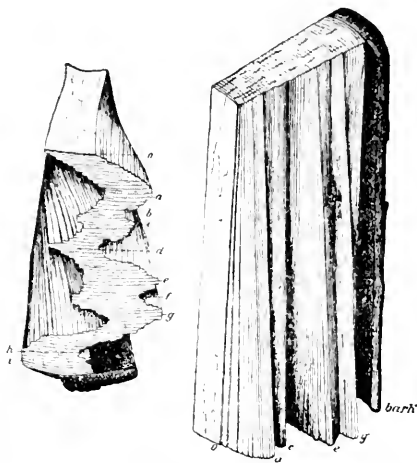


FIG. 12.—Alternating spiral grain in cypress. Side and end view of same piece. When the bark was at *a* the grain at this point was straight. From that time each year it grew more oblique in one direction, reaching a climax at *a*, and then turned back in the opposite direction. These alternations were repeated periodically, the bark sharing in these changes.

in many cases the course of the fibers is spiral or twisted around the tree as shown in fig. 11, and sometimes (commonly in butts of gum and cypress) the fibers of several layers are oblique in one direction, and those of the next series of layers are oblique in the opposite

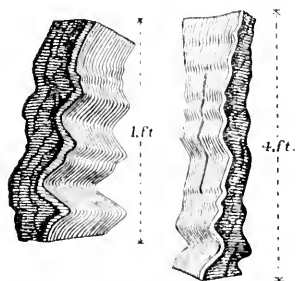


FIG. 13.—Wavy grain in beech; after Nördlinger.

direction, as shown in fig. 12; the wood is cross or twisted grained. Wavy grain in a tangential plain as seen on the radial section is illustrated in fig. 13, which represents an extreme case observed in beech. This same form also occurs on the radial plain, causing the tangential section to appear wavy or in transverse folds. When wavy grain is fine, i. e., the folds or ridges small but numerous, it gives rise to the "curly" structure frequently seen in maple. Ordinarily, neither wavy, spiral, nor alternate grain is visible

on the cross section; its existence often escapes the eye even on smooth, longitudinal faces in sawed material, so that the only safe guide to their discovery lies in splitting the wood in the two normal plains.

Generally the surface of the wood under the bark, and therefore also that of any layer in the interior, is not uniform and smooth, but is

channeled and pitted by numerous depressions which differ greatly in size and form. Usually, any one depression or elevation is restricted to one or few annual layers (i. e., seen only in one or few rings) and is then lost, being compensated (the surface at the particular spot evened up) by growth. In some woods, however, any depression or elevation once attained grows from year to year and reaches a maximum size which is maintained for many years, sometimes throughout life.

In maple, where this tendency to preserve any particular contour is very great, the depressions and elevations are usually small (commonly less than one-eighth inch), but very numerous. On tangent boards of such wood the sections of these pits and prominences appear as circlelets and give rise to the beautiful "bird's-eye" or "landscape" structure. Similar structures in the burls of black ash, maple, etc., are frequently due to the presence of dormant buds, which cause the surface of all the layers through which they pass to be covered by small conical elevations, whose cross sections on the sawed board appear as irregular circlelets or islets each with a dark speck, the section of the pith or "trace" of the dormant bud in the center.

In the wood of many broad leaved trees the wood fibers are much longer when full grown than when they are first formed in the cambium or growing zone. This causes the tips of each fiber to crowd in between the fibers above and below, and leads to an irregular interlacement of these fibers, which adds to the toughness but reduces the cleavability of the wood.

At the junction of limb and stem the fibers on the upper and lower sides of the limb behave differently. On the lower side they run from the stem into the limb, forming an uninterrupted strand or tissue and a perfect union. On the upper side the fibers bend aside, are not continuous into the limb, and hence the connection is imperfect (fig. 14).

Owing to this arrangement of the fibers, the cleft made in splitting never runs into the knot, if started on the side above the limb, but is apt to enter the knot if started below, a fact well understood in wood craft. When limbs die, decay, and break off, the remaining stubs are surrounded and may finally be covered by the growth of the trunk, and thus give rise to the annoying "dead" or "loose" knots.

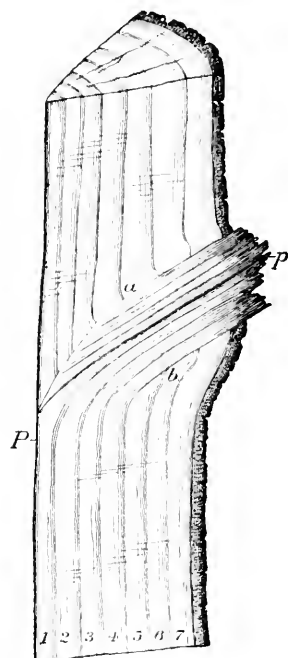


FIG. 14.—Section of wood showing position of the grain at base of a limb. *P*, pith of both stem and limb; 1-7, seven yearly layers of wood; *a*, *b*, knot or basal part of a limb which lived four years, then died and broke off near the stem, leaving the part to the left of *a*, *b*, a "sound" knot, the part to the right a "dead" knot, which would soon be entirely covered by the growing stem.

## COLOR AND ODOR.

Color, like structure, lends beauty to the wood, aids in its identification, and is of great value in the determination of its quality. Considering only the heartwood, the black color of the persimmon, the dark brown of the walnut, the light brown of the white oaks, the reddish brown of the red oaks, the yellowish white of the tulip and poplar, the brownish red of the redwood and cedar, the yellow of the papaw and sumac, are all reliable marks of distinction; and color together with luster and weight are only too often the only features depended upon in practice. Newly formed wood, like that of the outer few rings, has but little color. The sapwood generally is light, and the wood of trees which form no heartwood changes but little, except when stained by forerunners of disease.

The different tints of colors, whether the brown of oak, the orange brown of pine, the blackish tint of walnut, or the reddish cast of cedar, are due to pigments, while the deeper shade of the summer-wood bands in pine and cedar, or in oak or walnut, is due to the fact that the wood being denser, more of the colored wood substance occurs on a given space, i. e., there is more colored matter per square inch.

Wood is translucent, a thin disk of pine permitting light to pass through quite freely. This translucency affects the luster and brightness of lumber. When wood is attacked by fungi it becomes more opaque, loses its brightness, and in practice is designated "dead" in distinction to "live" or bright timber. Exposure to air darkens all wood; direct sunlight and occasional moistening hasten this change and cause it to penetrate deeper. Prolonged immersion has the same effect, pine wood becoming a dark gray while oak changes to a blackish brown.

Odor, like color, depends on chemical compounds, forming no part of the wood substance itself. Exposure to weather reduces, and often changes the odor, but a piece of dry longleaf pine, cedar, or camphor wood exhales apparently as much odor as ever, when a new surface is exposed.

Heartwood is more odoriferous than sapwood. Many kinds of wood are distinguished by strong and peculiar odors. This is especially the case with camphor, cedar, pine, oak, and mahogany, and the list would comprise every kind of wood in use, were our sense of smell developed in keeping with its importance. Decomposition is usually accompanied by pronounced odors; decaying poplar emits a disagreeable odor, while red oak often becomes fragrant, its smell resembling that of heliotrope.

## RESONANCE.

If a log or scantling is struck with the ax or hammer, a sound is emitted which varies in pitch and character with the shape and size of the stick, and also with the kind and condition of wood. Not only can



sound be produced by a direct blow, but a thin board may be set vibrating and be made to give a tone by merely producing a suitable tone in its vicinity. The vibrations of the air, caused by the motion of the strings of the piano, communicate themselves to the board, which vibrates in the same intervals as the string and reenforces the note. The note which a given piece of wood may emit varies in pitch directly with the elasticity, and indirectly with the weight, of the wood. The ability of a properly shaped sounding board to respond freely to all the notes within the range of an instrument, as well as to reflect the character of the notes thus emitted (i. e., whether melodious or not), depends, first, on the structure of the wood and next on the uniformity of the same throughout the board. In the manufacture of musical instruments all wood containing defects, knots, cross grain, resinous tracts, alternations of wide and narrow rings, and all wood in which summer and spring wood are strongly contrasted in structure and variable in their proportions, is rejected, and only radial sections (quarter sawed, or split) of wood of uniform structure and growth are used.

The irregularity in structure, due to the presence of relatively large pores and pith rays, excludes almost all our broad-leaved woods from such use, while the number of eligible woods among conifers is limited by the necessity of combining sufficient strength with uniformity in structure, absence of too pronounced bands of summer wood, and relative freedom from resin.

Spruce is the favored resonance wood; it is used for sounding boards both in pianos and violins, while for the resistant back and sides of the latter, the highly elastic hard maple is used. Preferably resonance wood is not bent to assume the final form; the belly of the violin is shaped from a thicker piece, so that every fiber is in the original as nearly unstrained condition as possible, and therefore free to vibrate. All wood for musical instruments is, of course, well seasoned, the final drying in kiln or warm room being preceded by careful seasoning at ordinary temperatures often for as many as seven years or more. The improvement of violins, not by age but by long usage, is probably due, not only to the adjustment of the numerous component parts to each other, but also to a change in the wood itself; years of vibrating enabling any given part to vibrate much more readily.



FIG. 15.—Cross section of a group of wood fibers.

## II.—WEIGHT OF WOOD.

A small cross section of wood, as in fig. 15, dropped into water, sinks, showing that the substance of which wood fiber or wood is built up is heavier than water. By immersing the wood successively in heavier liquids, until we find a liquid in which it does not sink, and comparing the weight of the same with water, we find that wood substance is about 1.6 times as heavy as water, and that this is as true of poplar as of oak or pine.

Separating a single cell, as shown in fig. 16, *a*, drying and then dropping it into water, it floats. The air-filled cell cavity or interior reduces its weight, and, like a corked empty bottle, it weighs less than the water. Soon, however, water soaks into the cell, when it fills up and sinks.

Many such cells grown together, as in a block of wood, sink when all or most of them are filled with water, but will float as long as the majority are empty or only partly filled. This is why a green, sappy pine pole soon sinks in "driving" (floating). Its cells are largely filled before it is thrown in, and but little additional water suffices to make its weight greater than that of the water.

In a good-sized white pine log, composed chiefly of empty cells (heart-wood), the water requires a very long time to fill up the cells (five years would not suffice to fill them all), and therefore the log may float for many months. When the wall of the wood fiber is very thick (five-eighths or more of the volume), as in fig. 16, *b*, the fiber sinks whether empty or filled. This applies to most of the fibers of the dark summer-wood bands in pines, and to the compact fibers of oak or hickory, and many, especially tropical woods, have such thick-walled cells and so little empty or air space that they never float.

Here, then, are the two main factors of weight in wood: The amount of cell wall, or wood substance, constant for any given piece, and the amount of water contained in the wood, variable even in the standing tree, and only in part eliminated in drying.

The weight of the green wood of any species varies chiefly as the second factor, and is entirely misleading if the relative weight of different kinds is sought. Thus some green sticks of the otherwise lighter cypress and gum sink more readily than fresh oak.



FIG. 16.—Isolated fibers.

The weight of sapwood, or the sappy peripheral part of our common lumber woods, is always great, whether cut in winter or summer. It rarely falls much below 45 pounds and commonly exceeds 55 pounds to the cubic foot, even in our lighter wooded species.

It follows that the green wood of a sapling is heavier than that of an old tree, the fresh wood from a disk of the upper part of a tree often heavier than that of the lower part, and the wood near the bark heavier than that nearer the pith, and also that the advantage of drying the wood before shipping is most important in sappy and light kinds.

When kiln dried, the misleading moisture factor of weight is uniformly reduced and a fair comparison possible. For the sake of convenience in comparison the weight of wood is expressed either as the weight per cubic foot, or, what is still more convenient, as specific weight or density. If an old longleaf pine is cut up as shown in fig. 17, the wood of disk No. 1 is heavier than that of disk No. 2, the latter heavier

than that of disk No. 3, and the wood of the top disk is found to be only about three-fourths as heavy as that of disk No. 1.

Similarly, if disk No. 2 is cut up as in the figure, the specific weight of the different pieces is:

<i>a</i>	about 0.52
<i>b</i>	about 0.64
<i>c</i>	about 0.67
<i>d, e, f</i>	about 0.65

showing that in this disk, at least, the wood formed during the many years' growth, represented in piece *a*, is much lighter than that of former years. It also shows that the best wood is the middle part, with its large proportion of dark summerwood bands.

Cutting up all disks in the same way, it will be found that the piece *a* of the first disk is heavier than piece *a* of the fifth, and that piece *c* of the first disk exceeds the piece *c* of all the other disks. This shows that the wood grown during the same number of years is lighter in the upper parts of the stem; and if the disks are smoothed on their radial surfaces and set up one on top of the other in their regular order for sake of comparison, this decrease in weight will be seen to be accompanied by a decrease in the amount of summer wood. The color effect of the upper disks is conspicuously lighter.

If our old pine had been cut one hundred and fifty years ago, before the outer, lighter wood was laid on, it is evident that the weight of the wood of any one disk would have been found to increase from the center outward, and no subsequent decrease could have been observed.

In a thrifty young pine, then, the wood is heavier from the center outward, and lighter from below upward; only the wood laid on in old age falls in weight below the average. The number of brownish bands of summer wood are a direct indication of these differences.

If an old oak is cut up in the same manner, the butt cut is also found heaviest and the top lightest, but, unlike the disk of pine, the disk of oak has its firmest wood at the center and each successive piece from the center outward is lighter than its inner neighbor.

Examining the pieces, this difference is not as readily explained by the appearance of each piece as in the case of pine wood. Nevertheless, one conspicuous point appears at once, the pores, so very distinct in oak, are very minute in the wood near the center and thus the wood is far less porous. Studying different trees it is found that, in the pines, wood with narrow rings is just as heavy as, and often heavier than the wood with wider rings, but if the rings are unusually narrow in any part of the disk the wood has a lighter color; that is, there is less summer wood and therefore less weight.

In oak, ash, or elm trees of thrifty growth, the rings fairly wide (not less than one-twelfth inch), always form the heaviest wood, while any

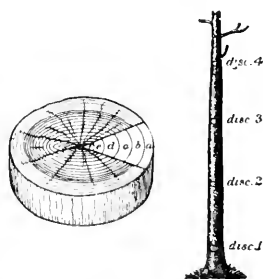


FIG. 17.—Orientation of wood samples.

piece with very narrow rings is light. On the other hand, the weight of a piece of hard maple or birch is quite independent of the width of its rings.

The bases of limbs (knots) are usually heavy, very heavy in conifers, and also the wood which surrounds them, but generally the wood of the limbs is lighter than that of the stem, and the wood of the roots is the lightest.

In general, it may be said that none of the native woods in common use in this country are, when dry, as heavy as water, i. e., 62 pounds to the cubic foot. Few exceed 50 pounds, while most of them fall below 40 pounds, and much of the pine and other coniferous wood weighs less than 30 pounds per cubic foot.

The weight of the wood is, in itself, an important quality. Weight assists in distinguishing maple from poplar. Lightness, coupled with great strength and stiffness, recommends wood for a thousand different uses. To a large extent weight predicates the strength of the wood, at least in the same species, so that a heavy piece of oak will exceed in strength a light piece of the same species, and in pine it appears probable that, weight for weight, the strength of the wood of various pines is nearly equal.

*Weight of kiln-dried wood of different species.*

	Approximate.		
	Specific weight.	Weight of—	
		1 cubic foot.	1,000 feet of lumber.
(a) Very heavy woods:			
Hickory, oak, persimmon, osage orange, black locust, hackberry, blue beech, best of elm, and ash.....	0.70-0.80	Pounds. 42-48	Pounds. 3,700
(b) Heavy woods:			
Ash, elm, cherry, birch, maple, beech, walnut, sour gum, coffee tree, honey locust, best of Southern pine, and tamarack.....	.60-.70	36-42	3,200
(c) Woods of medium weight:			
Southern pine, pitch pine, tamarack, Douglas spruce, western hemlock, sweet gum, soft maple, sycamore, sassafras, mulberry, light grades of birch and cherry.....	.50-.60	30-36	2,700
(d) Light woods:			
Norway and bull pine, red cedar, cypress, hemlock, the heavier spruce and fir, redwood, basswood, chestnut, butternut, tulip, catalpa, buckeye, heavier grades of poplar.....	.40-.50	24-30	2,200
(e) Very light woods:			
White pine, spruce, fir, white cedar, poplar.....	.30-.40	18-24	1,800

For scientific names see list, p. 72.

Since ordinary lumber contains knots and also more water than is here assumed, and also since its dimensions either exceed or fall short of perfect measurement, the figures in the table are only approximate.

Thus 1,000 feet, B. M., of longleaf pine weighs:

	Pounds.
Rough and green.....	4,500
Boards, rough but seasoned.....	3,500
Boards, dressed and seasoned.....	3,000
Flooring, matched, dressed and seasoned.....	2,500
Weatherboarding beveled and dressed.....	1,500

## III.—MOISTURE IN WOOD.

Water may occur in wood in three conditions: (1) It forms the greater part (over 90 per cent) of the protoplasmic contents of the living cells; (2) it saturates the walls of all cells, and (3) it entirely or at least partly fills the cavities of the lifeless cells, fibers, and vessels. In the sapwood of pine it occurs in all three forms; in the heartwood only in the second form, it merely saturates the walls. Of 100 pounds of water associated with 100 pounds of dry wood substance in 200 pounds of fresh sapwood of white pine, about 35 pounds are needed to saturate the cell walls, less than 5 pounds are contained in living cells, and the remaining 60 pounds partly fill the cavities of the wood fibers. This latter forms the sap as ordinarily understood. It is water brought from the soil, containing small quantities of mineral salts, and in certain species (maple, birch, etc.) it also contains at certain times a small percentage of sugar and other organic matter. These organic substances are the dissolved reserve food, stored during winter in the pith rays, etc., of the wood and bark; generally but a mere trace of them is to be found. From this it appears that the solids contained in the sap, such as albumen, gum, sugar, etc., can not exercise the influence on the strength of the wood which is so commonly claimed for them.

The wood next to the bark contains the most water. In the species which do not form heartwood the decrease toward the pith is gradual, but where this is formed, the change from a more moist to a drier condition is usually quite abrupt at the sapwood limit. In longleaf pine, the wood of the outer 1 inch of a disk may contain 50 per cent of water, that of the next, or second inch, only 35 per cent, and that of the heartwood only 20 per cent. In such a tree the amount of water in any one section varies with the amount of sapwood, and is therefore greater for the upper than the lower cuts, greater for limbs than stems, and greatest of all in the roots.

Different trees, even of the same kind and from the same place, differ as to the amount of water they contain. A thrifty tree contains more water than a stunted one, and a young tree more than an old one, while the wood of all trees varies in its moisture relations with the season of the year.

Contrary to the general belief a tree contains about as much water in winter as in summer. The fact that the bark peels easily in the spring depends on the presence of incomplete, soft tissue found between wood and bark during this season and has little to do with the total amount of water contained in the wood of the stem.

Even in the living tree a flow of sap from a cut occurs only in certain kinds of trees and under special circumstances; from boards, timber, etc., the water does not flow out, as is sometimes believed, but must be evaporated.<sup>1</sup>

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<sup>1</sup>The seeming exceptions to this rule are mostly referable to two causes, namely: (a) Clefts or "shakes" will allow water contained in them to flow out. (b) From sound wood, if very sappy, water is forced out whenever the wood is warmed, just as water flows from green wood in the stove.

The rapidity with which water is evaporated, that is, the rate of drying, depends on the size and shape of the piece and on the structure of the wood. An inch board dries more than four times as fast as a 4-inch plank and more than twenty times as fast as a 10-inch timber. White pine dries faster than oak. A very moist piece of pine or oak will, during one hour, lose more than four times as much water per square inch from the cross section, but only one-half as much from the tangential, as from the radial section.

In a long timber, where the end or cross sections form but a small part of the drying surface, this difference is not so evident. Nevertheless, the ends dry and shrink first, and being opposed in this shrinking by the more moist adjoining parts, they check, the cracks largely disappearing as seasoning progresses.

High temperatures are very effective in evaporating the water from wood, no matter how humid the air. A fresh piece of sapwood may lose weight in boiling water, and can be dried to quite an extent in hot steam.

Kept on a shelf in an ordinary dwelling wood still retains 8 to 10 per cent of its weight of water, and always contains more water per pound than the surrounding air. Nor is this amount of water constant; the weight of a pan full of shavings varies with the time of day, being on a summer day greatest in the morning and least in the afternoon.

Desiccating the air with chemicals will cause the wood to dry, but wood thus dried at 80° F. will still lose water in the kiln. Wood dried at 120° F. loses water still if dried at 200° F., and this again will lose more water if the temperature is raised. So that absolutely dry wood can not be obtained, and chemical destruction sets in before all the water is driven off.

On removal from the kiln the wood at once takes up water from the air, even in the driest weather. At first the absorption is quite rapid; at the end of a week a short piece of pine, 1½ inches thick, has regained two-thirds of, and, in a few months, all the moisture which it had when air dry, 8 to 10 per cent, and also its former dimensions.

In thin boards all parts soon attain the same degree of dryness; in heavy timbers the interior remains moister for many months, and even years, than the exterior parts. Finally an equilibrium is reached, and then only the outer parts change with the weather.

With kiln-dried wood all parts are equally dry, and when exposed the moisture coming from the air must pass in through the outer parts, and thus the order is reversed. Ordinary timber requires months before it is at its best; kiln-dry timber, if properly handled, is prime at once.

Dry wood, when soaked in water, soon regains its original volume, and in the heartwood portion it may even surpass it; that is to say, swell to a larger dimension than it had when green. With the soaking it continues to increase in weight, the cell cavities filling with water, .

and if left many months all pieces sink. Yet even after a year's immersion a piece of oak 2 by 2 inches and only 6 inches long still contains air, i. e., it has not taken up all the water it can. By rafting, or prolonged immersion, wood loses some of its weight, soluble materials being leached out, but it is not impaired either as fuel or as building material. Immersion and, still more, boiling and steaming reduce the hygroscopicity of wood and, therefore, also the troublesome "working" or shrinking and swelling.

Exposure in dry air to a temperature of  $300^{\circ}$  F. for a short time reduces, but does not destroy, the hygroscopicity and with it the tendency to shrink and swell. A piece of red oak, which has been subjected to a temperature of over  $300^{\circ}$  F., still swells in hot water and shrinks in the kiln.

In artificial drying, temperatures of from  $158^{\circ}$  F. to  $180^{\circ}$  F. are usually employed. Pine, spruce, cypress, cedar, etc., are dried fresh from the saw, allowing four days for 1-inch boards; hard woods, especially oak, ash, maple, birch, sycamore, etc., are air-seasoned for three to six months, to allow the first shrinkage to take place more gradually, and are then exposed to the above temperatures in the kiln for about six to ten days for 1-inch lumber. Freshly cut poplar and cottonwood are often dried directly in kilns.

By employing lower temperatures,  $100^{\circ}$  to  $120^{\circ}$  F., green oak, ash, etc., can be seasoned in dry kilns without danger to the material. Steaming the lumber is commonly resorted to in order to prevent checking and "casehardening," but not, as has frequently been asserted, to enable the board to dry. Yard-dried lumber is not dry, and its moisture is too unevenly distributed to insure good behavior after manufacture. Careful piling of the lumber, both in the yard and kiln, is essential to good drying. Piling boards on edge or standing them on end is believed to hasten drying. This is true only because in either case the air can circulate more freely around them than when they are piled in the ordinary way. Boards on end dry unequally: the upper half dries much faster than the lower half and horizontal piling is, therefore, preferable.

Since the proportion of sap and heart wood varies with size, age, species, and individual, the following figures must be regarded as mere approximations:

*Pounds of water lost in drying 100 pounds of green wood in the kiln.*

	Sapwood or outer part.	Heartwood or interior.
(1) Pines, cedars, spruces, and firs .....	45-65	16-25
(2) Cypress, extremely variable .....	50-65	18-60
(3) Poplar, cottonwood, basswood .....	60-65	40-60
(4) Oak, beech, ash, elm, maple, birch, hickory, hestnut, walnut, and sycamore .....	40-50	30-40

The lighter kinds have the most water in the sapwood, thus sycamore has more than hickory.

## IV.—SHRINKAGE OF WOOD.

When a short piece of wood fiber, such as that shown in fig. 18, *A*, is dried it shrinks, its wall grows thinner (as indicated by dotted lines), its width, *a b*, the thickness of the fiber, becomes smaller, and the cavity or opening larger, but, strange to say, the height or length, *b c*, remains the same. In a similar piece of fiber with a thinner wall (fig. 18, *B*) the effect is the same, but the wall being only half as thick the total change is only about half as great.<sup>1</sup>

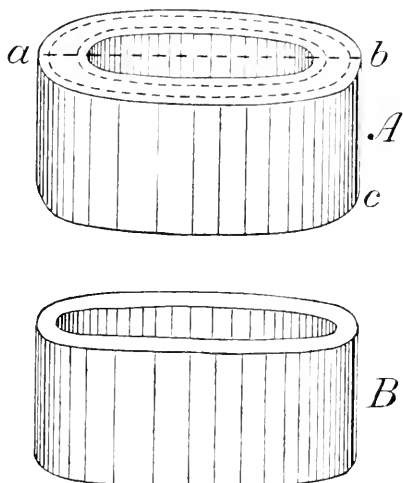


FIG. 18.—Short pieces of wood fibers, one thick, the other thin walled, magnified.

This indicates that the water in the cavity or lumen of a fiber has nothing to do with its dimensions, and that if the cell walls are saturated it makes no difference in the volume of a block of pine wood whether the cell cavities are empty as in the heartwood or three-fourths filled as in the sapwood.



FIG. 19.—Isolated cell.

If an entire fiber, as shown in fig. 19, is dried, the wall at its ends *a* and *b*, like those of the sides, grow thinner, and thereby the length of the entire cell grows shorter. Since this length is often a hundred or more times as great as the diameter, the effect of this shrinkage is inappreciable; and if a long board shrinks lengthwise, it is largely due, as we shall see, to quite another cause.

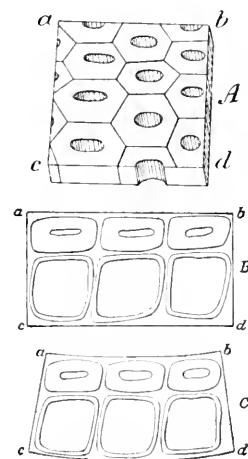


FIG. 20.—Warping of wood.

A thin cross section of several fibers (see fig. 20, *A*) like the piece of a single fiber shrinks when dried, the wall of each fiber becomes thinner, and thus each piece smaller, and the piece on the whole necessarily

<sup>1</sup> Though generally true, it must not be supposed that the fibers of all species, or even the fibers of the same tree, shrink exactly in proportion to the thickness of their walls.



shares this diminution of size, the distances,  $a b$  and  $c d$ , each becoming shorter. Where the cells are very similar in size and in the thickness of their walls, as in the case of piece *A*, fig. 20,  $a b$  and  $c d$  become shorter by about the same amount; but if the piece is made up of fibers, some of which have thin and others thick walls, as piece *B*, fig. 20, then the row of thick-walled cells shrinking much more than the row of thin-walled cells, the piece becomes unevenly shrunk or warped as shown in fig. 20, *C*. Not only is the piece warped, but the force which led to this warping continues to strain the interior parts of the piece in different directions.

Since in all our woods cells with thick walls and cells with thin walls are more or less intermixed, and especially as the spring wood and summer wood nearly always differ from each other in this respect, strains and tendencies to warp are always active when wood dries out, because the summer wood shrinks more than the spring wood, heavier wood in general more than light wood of the same kind.

If the piece *A*, fig. 20, after drying, is placed edgewise on moist blotting paper, the cells on the underside, at  $c d$ , take up moisture from the paper and swell before the upper cells at  $a b$  receive any moisture. This causes the underside of the piece to become longer than the upper side and, as in the case of piece *C*, warping occurs. Soon, however, the moisture penetrates to all the cells and the piece straightens out. A thin board behaves exactly like this minute piece, only the process is slower and more easily observed. But while a thin board of pine curves laterally, it remains quite straight lengthwise, since in this direction both shrinkage and swelling are small. A thin disk or cross

section swells, and when moistened on one side warps as readily in one direction as in another. If a green board is exposed to the sun with one side, warping is produced by removal of water and consequent shrinkage of the upper side, and the course of the process is simply reversed.

As already stated, wood loses water faster from the end than from the longitudinal faces. Hence the ends shrink at a different rate from the interior parts.

In a timber, the width  $A B$  (fig. 21, *X*) may have shortened (fig. 21, *Y*), while a short distance from the end  $c d$ , the original width is still preserved. This should produce a bending of the parts toward the center of the piece as shown in exaggeration at *Y*, but the rigidity of

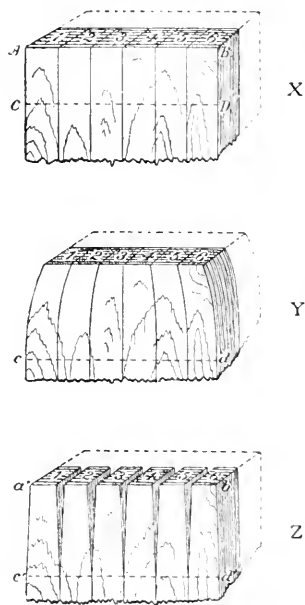


FIG. 21.—Formation of checks.

the several parts of the timber prevents such bending and the consequent strain leads to their separation as shown at Z, the end surface of the timber being "checked."

As the timber dries out, the line *cd* becomes shorter, the parts 1 to 6 are allowed to approach again, and the checks close up and are no longer visible.

The faster the drying at the surface, the greater is the difference in the moisture of the different parts, and hence the greater the strains and consequently also the amount of checking. This becomes very evident when fresh wood is placed in the sun, and still more in a hot kiln. While most of these smaller checks are thus only temporary, closing up again, some large radial checks remain and even grow larger as drying progresses. Their cause is a different one and will presently be explained.

The temporary checks not only occur at the ends, but are developed on the sides also, only to a much smaller degree. They become especially annoying on the surface of thick planks of hard woods, and also on peeled logs when exposed to the sun.

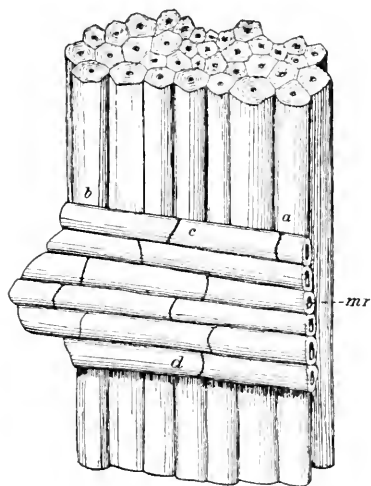


FIG. 22.—Small pith ray in oak. *a, b*, wood fibers; *c, d*, cells of pith ray.

So far we have considered the wood as if made up only of parallel fibers all placed longitudinally in the log. This, however, is not the case. A large part of the wood is formed by the medullary or pith rays. In pine over 15,000 of these occur on a square inch of a tangential section, and even in oak the very large rays, which are readily visible to the eye, represent scarcely a hundredth part of the number which the microscope reveals.

As seen in fig. 22 the cells of these rays have their length at right angles to the direction of the wood fibers.

If a large pith ray of white oak is whittled out and allowed to dry it is found to shrink greatly in the direction from *c* to *d* (fig. 22), while, as we have stated, the fibers to which the ray is firmly grown in the wood do not shrink in the same direction. Therefore, in the wood, as the cells of the pith ray dry, they pull on the longitudinal fibers and try to shorten them, and, being opposed by the rigidity of the fibers, the pith ray is greatly strained. But this is not the only strain it has to bear. Since the fibers from *a* to *b* (fig. 22) shrink as much again as the pith ray in this, its longitudinal direction, the fibers tend to shorten the ray, and the latter, in opposing this, prevents the former from

shrinking as much as they otherwise would. Thus the structure is subjected to two severe strains at right angles to each other, and herein lies the greatest difficulty of wood seasoning, for whenever the wood dries rapidly these fibers have not the chance to "give" or accommodate themselves, and hence fibers and pith rays separate and checks result which, whether visible or not, are detrimental in the use of the wood.

The contraction of the pith rays parallel to the length of the board is probably one of the causes of the small amount of longitudinal shrinkage which has been observed in boards.<sup>1</sup> The smaller shrinkage of the pith rays along the radius of the log (the length of the pith ray) opposing the shrinkage of the fibers in this direction becomes one of the causes of the second great trouble in wood seasoning, namely, the difference in the amount of the shrinkage along the radius and that along the rings or tangent.

This greater tangential shrinkage appears to be due, in part, to the cause just mentioned, but also to the fact that the greatly shrinking bands of summer wood are interrupted, along the radius, by as many bands of porous spring wood, while they are continuous in the tangential direction. In this direction, therefore, each such band tends to shrink, as if the entire piece were composed of summer wood, and since the summer wood represents the greater part of the wood substance, this tendency of greater tangential shrinkage prevails.

The effect of this greater tangential shrinkage affects every phase of woodworking. It leads to permanent checks, and causes the log to split open on drying.

Sawed in two, the flat sides of the log become convex, as in fig. 23; sawed into a timber, it checks along the median line of the four faces, and if converted into boards, the latter take on the forms shown in fig. 23, all owing to the greater tangential shrinkage of the wood.

Briefly, then, shrinkage of wood is due to the fact that the cell walls grow thinner on drying. The thicker cell walls and therefore the heavier wood shrinks most, while the water in the cell cavities does not influence the volume of the wood. Owing to the great difference of cells in shape, size, and thickness of walls, and still more in their arrangement, shrinkage is not uniform in any kind of wood. This irregularity produces strains, which grow with the difference between

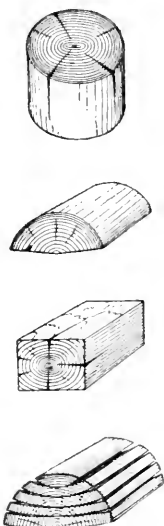


FIG. 23.—Effects of shrinkage.

<sup>1</sup> In addition to this all fibers having an oblique position, as those at pith rays and knots, also the oblique, tapering ends of all fibers contribute to this longitudinal shrinkage, since one component of their normal shrinkage is longitudinal.

adjoining cells and are greatest at the pith rays. These strains cause warping and checking, but exist even where no outward signs are visible; they are greater if the wood is dried rapidly than if dried slowly, but can never be entirely avoided.

Temporary checks are caused by the more rapid drying of the outer parts of any stick: permanent checks are due to the greater shrinkage, tangentially, along the rings than that along the radius. This, too, is the cause of most of the ordinary phenomena of shrinkage, such as the difference in behavior of entire and quartered logs "bastard" (tangent) and "rift" (radial) boards, etc., and explains many of the phenomena erroneously attributed to the influence of bark, or of the greater shrinkage of outer and inner parts of any log.

Once dry, wood may be swelled again to its original size by soaking in water, boiling, or steaming. Soaked pieces, on drying, shrink again as before; boiled and steamed pieces do the same, but to a slightly less degree. Neither hygroscopicity, i. e., the capacity of taking up water, nor shrinkage of wood can be overcome by drying at temperatures below 200° F. Higher temperatures, however, reduce these qualities, but

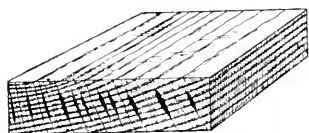


FIG. 24.—"Honeycombed" board.  
The checks or cracks form along the pith rays.

nothing short of a coaling heat robs wood of the capacity to shrink and swell. Rapidly dried in the kiln, the wood of oak and other hard woods "case-harden," that is, the outer part dries and shrinks before the interior has a chance to do the same, and thus forms a firm shell or case of shrunken, commonly checked wood around the interior. This shell

does not prevent the interior from drying, but when this drying occurs, the interior is commonly checked along the medullary rays, as shown in fig. 24. In practice this occurrence can be prevented by steaming the lumber in the kiln, and still better by drying the wood in the open air or in a shed before placing in the kiln. Since only the first shrinking is apt to check the wood, any kind of lumber which has once been air dried (three to six months for 1-inch stuff) may be subjected to kiln heat without any danger. Kept in a bent or warped condition during the first shrinking, the wood retains the shape to which it was bent and firmly opposes any attempt at subsequent straightening.

Sapwood, as a rule, shrinks more than heartwood of the same weight, but very heavy heartwood may shrink more than lighter sapwood. The amount of water in wood is no criterion of its shrinkage, since in wet wood most of the water is held in the cavities, where it has no effect on the volume.

The wood of pine, spruce, cypress, etc., with its very regular structure, dries and shrinks evenly and suffers much less in seasoning than the wood of broad-leaved trees. Among the latter, oak is the most difficult to dry without injury. Small-sized split ware and "rift" boards season better than ordinary boards and planks.

To avoid "working" or warping and checking, all high-grade stock is carefully seasoned, preferably in a kiln, before manufacture. Thicker pieces may be made of several parts glued together; larger surfaces are made in panels or of smaller pieces covered with veneer. Boring is sometimes resorted to to prevent the checking of wooden columns.

Since repeated swelling increases the injuries due to seasoning, wood should be protected against moisture when once it is dry.

Since the shrinkage of our woods has never been carefully studied, and since wood, even from the same tree, varies within considerable limits, the figures given in the following table are to be regarded as mere approximations. The shrinkage along the radius and that along the tangent (parallel to the rings) are not stated separately in the following table, and the figures represent an average of the shrinkage in the two directions. Thus, if the shrinkage of soft pine is given at 3 inches per hundred, it means that the sum of radial and tangential shrinkage is about 6 inches, of which about 4 inches fall to the tangent and 2 inches to the radius, the ratio between these varying from 3 to 2, a ratio which practically prevails in most of our woods.

Since only an insignificant longitudinal shrinkage takes place (being commonly less than 0.1 inch per hundred), the change in volume during drying is about equal to the sum of the radial and tangential shrinkage, or twice the amount of linear shrinkage indicated in the table.

Thus, if the linear average shrinkage of soft pine is 3 inches per hundred, the shrinkage in volume is about 6 cubic inches for each 100 cubic inches of fresh wood.

*Approximate shrinkage of a board, or set of boards, 100 inches wide, drying in the open air.*

	Shrink- age.
	<i>Inches.</i>
(1) All light conifers (soft pine, spruce, cedar, cypress).....	3
(2) Heavy conifers (hard pine, tamarack, yew), honey locust, box elder, wood of old oaks....	4
(3) Ash, elm, walnut, poplar, maple, beech, sycamore, cherry, black locust.....	5
(4) Basswood, birch, chestnut, horse chestnut, blue beech, young locust.....	6
(5) Hickory, young oak, especially red oak.....	Up to 10

## V.—MECHANICAL PROPERTIES OF WOOD.

Every joist and studding, every rafter, sash, and door, the chair we sit on, the floor we walk on, the wood of the wagon or boat we ride in are all continually tested as to their stiffness and strength, their hardness and toughness. Every step from the simple splitting of a shingle or stave to the construction of the most elegant carriage or sideboard involves a knowledge, not only of one, but of several, of the mechanical properties of the material.

In the shop the fitness of the wood for a given purpose never depends on any one quality alone, but invariably upon a combination of several qualities. A spoke must not only be strong, it must be stiff to hold its

shape, it must be tough to avoid shattering to pieces, and it must also be hard or else its tenons will become loose in their mortises.

Selecting wood in this way, the woodworker has learned almost all that is at present known about his material, but in many cases the great difficulty which always attends the judgment of complex phenomena has led to erroneous conclusions, and not a few well-established beliefs have their origin more in accidental error of observation than in fact.

The experimenter endeavors to avoid this complexity by testing the wood for each kind of resistance separately; when tested as to their stiffness, the pieces are all shaped, placed, and loaded alike. The wood is selected with a definite object in view; it is green or dry, clear or knotty, straight or crossgrained, according as he wishes to find out the influence of each of these conditions. If pine and oak are to be compared, the pieces are from the same position in the tree and are tried under exactly the same conditions, and thus the case is simplified.

But even results thus arrived at can not be used indiscriminately, and the figures on the strength of oak given in any book must not be supposed to apply to all oak, if tested in the given manner. This is due to the fact that a piece of wood is not simply a material but a structure, just as much as a railroad bridge or a balloon frame, and as such varies greatly even in the wood of the same tree, nay, more than that, even in the same year's growth of the same cross section of a log.

A scantling resists bending; it is stiff. On removal of the load it straightens; it is elastic. A column, a prop, or the spoke of a wagon wheel resists being crushed endwise. So does the upper side of a joist or beam when loaded, while the underside of the beam or of an ax handle suffers in tension. The tenons of a window sash or door tend to break out their mortises, the wood has to resist shearing along the fibers; the steel edge of the eye tends to cut into the hammer handle, it tries to shear it across the grain, and every nail, screw, bore hole, or mortise tends to split the board and tries the wood as to its cleavability, while all "bent" ware, from the wicker basket to the one-piece felly or ship's knee, involves its flexibility.

#### STIFFNESS.

If 100 pounds placed in the middle of a stick 2 by 2 inches and 4 feet long, supported at both ends, bend or "deflect" this stick one-eighth of an inch (in the middle), then 200 pounds will bend it about one-fourth inch, 300 pounds three-eighths inch, the deflection varying directly as the load. Soon, however, a point is reached where an additional 100 pounds adds more than one-eighth inch to the deflection—the limit of elasticity has been reached. Taking another piece from the straight grained and perfectly clear plank of the same depth and width, but 8 feet long, the load of 100 pounds will cause it to bend not only one-eighth inch, but will deflect it by about 1 inch. Doubling the length

reduces the stiffness eightfold. Stiffness then decreases as the cube of the length.

Cutting out a piece 2 by 4 inches and 4 feet long, placing it flatwise so that it is double the width of the former stick and loading it with 100 pounds, we find it bending only one-sixteenth inch; doubling the width doubles the stiffness.

Setting the same 2 by 4 inch piece on edge, so that it is 2 inches wide and 4 inches deep, the load of 100 pounds bends it only about one sixty-fourth inch; doubling the thickness increases the stiffness about eightfold.

It follows that if we double the length and wish to retain the same stiffness we must also double the thickness of the piece.

A piece of wood is usually stiffer with the annual rings set vertically than if the rings are placed horizontally to the load.

Crossgrained and knotty wood, to be sure, is not as stiff as clear lumber; a knot on the upper side of a joist, which must resist in compression, is, however, not so detrimental as a knot on the lower side, where it is tried in tension.

Every large timber which comes from the central part of the tree contains knots, and much of its wood is cut more or less obliquely across the grain, both conditions rendering such material comparatively less stiff than small clear pieces.

The same stick of pine, green or wet, is only about two-thirds as stiff as when dry. A heavy piece of longleaf pine is stiffer than a light piece; heavy pine in general is stiffer than light pine, but a piece of hickory, although heavier than the pine, may not be as stiff as the piece of longleaf pine, and a good piece of larch exceeds in stiffness any oak of the same weight.

In the same tree stiffness varies with the weight, the heavier wood being the stiffer; thus the heavier wood of the butt log is stiffer than that of the top; timber with much of the heavy summer wood is stiffer than timber of the same kind with less summer wood. In old trees (of pine) the center of the tree and the sap are the least stiff; in thrifty young pine the center is the least stiff, but in young second growth hard woods it is the stiffest.

Since it is desirable, and for many purposes essential, to know beforehand that a given piece with a given load will bend only a given amount, the stiffness of wood is usually stated in a uniform manner and under the term "modulus (measure) of elasticity."

If AB, fig. 25, is a piece of wood, and  $d$  the deflection produced by a weight or load, the elasticity of the wood, as usually stated, is found by the formula:

$$\text{Modulus of elasticity} = \frac{W L^3}{4 D b d^3}$$

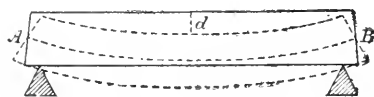


FIG. 25.—Bending a beam.

where  $W$  is the weight,  $l$  the length,  $b$  and  $d$  the breadth and depth of the stick, and  $D$  the deflection for the load  $W$ . In the following table the woods are grouped according to their stiffness. The figures are only rough approximations which are based on the data given in Vol. IX of the Tenth Census. The first column contains the above modulus, the second shows how many pounds will produce a deflection of 1 inch in a stick 1 by 1 by 12 inches, assuming that it could endure such bending within the limits of elasticity, and the third column gives the number of pounds which will bend a stick 2 by 2 inches and 10 feet long through 1 inch.

The stick is assumed to rest on both ends; if it is a cantilever, i. e., fastened at one end and loaded at the other, it bears but half as much load at its end for the same deflection.

From the third column it is easy to find how many pounds would bend a piece of the same kind of other dimensions. A 2 by 4 inch bears eight, a 2 by 6 inch twenty-seven times as much as the 2 by 2 inch; a piece 8 feet long is about twice as stiff as a 10-foot piece; a piece 12 feet, only about three-fifths, 14 feet one-third, 16 feet two-ninths, 18 feet one-sixth, and 20 feet one-eighth as stiff.

The number of pounds which will bend any piece of sawed timber by 1 inch may be found by using the formula:

$$\text{Necessary weight} = \frac{4 E b d^3}{l^3}$$

where  $E$  is the figure in the first column,  $b$ ,  $d$ ,  $l$ , breadth, depth, and length of the timber in inches. If the deflection is not to exceed one-half inch, only one-half the load, and if one-fourth inch, only one-fourth the load, is permissible.

To allow for normal irregularities in the structure of wood itself, as well as in the aggregate structure of timbers, an allowance is made on the numbers which have been found by experiment; this allowance is called the "factor of safety." Where the selection of the wood is not very perfect, the load is a variable one, and the safety of human life depends on the structure, the factor is usually taken quite high, as much as 6 or 10, i. e., only one-sixth or one-tenth of the figures given in the tables is considered safe, and the beam is made six to ten times as heavy as the calculation requires.



*Table of stiffness (modulus of elasticity) of dry wood.—General averages.*

Species.	Modulus of elasticity $E = \frac{W l^3}{4 D \delta l^3}$ per square inch.	Approximate weight which deflects by 1 inch a piece—		
		1 by 1 inch and 12 inches long.	2 by 2 inches and 10 feet long.	
(1) Live oak, good tamarack, longleaf, Cuban, and short- leaf pine, good Douglas spruce, western hemlock, yel- low and cherry birch, hard maple, beech, locust, and the best of oak and hickory.....	Pounds 1,680,000	Pounds. 3,900	Pounds. 62	
(2) Birch, common oak, hickory, white and black spruce, loblolly and red pine, cypress, best of ash, elm, and poplar and black walnut.....	1,400,000	3,200	51	
(3) Maples, cherry, ash, elm, sycamore, sweet gum, butter- nut, poplar, basswood, white, sugar and bull pine, cedars, scrub pine, hemlock, and fir.....	1,100,000	2,500	40	
(4) Box elder, horse chestnut, a number of western soft pines, inferior grades of hard woods.....	1,100,000	12,500	40	

<sup>1</sup> Less than.

## CROSS-BREAKING OR BENDING STRENGTH.

When the addition of 100 pounds to the load on our 2 by 2 inch piece begins to add more than one-eighth inch to the deflection, that is, when the stick has been bent beyond its "elastic limit," it still requires an increase of 30 to 50 per cent to the load before the stick breaks. The load which is borne before the limit of elasticity is reached indicates the strength of the wood up to this important point; the load which causes it to break represents its absolute strength, or the "cross-breaking or bending strength" as it is commonly called.

In longleaf pine the former (modulus of strength at the elastic limit),<sup>1</sup> is commonly about three-fourths of the latter. If left loaded for a considerable time, a load but little greater than that which brings the stick to its elastic limit will cause it to break, and this load should therefore not be exceeded.

Unlike the stiffness, the strength of a timber varies approximately with the squares of the thickness and decreases directly with increasing length and not with the cube of this latter dimension. Thus, if our piece 2 by 2 inches and 4 feet long can bear 1,000 pounds before it breaks, a 2 by 4 inch kind flat will break with about 2,000 pounds, and if set edgewise, it requires about 4,000 pounds to break it, while a piece of the same kind of 2 by 2 inches, and double the length (8 feet), breaks with half the original load, or only 500 pounds.

All conditions of the material which influence the stiffness also influence the bending strength. Seasoning increases, moisture decreases, the strength; knots and crossgrain depress it and both are more dangerous on the lower than on the upper side. But while the conifers with their simple cell structure excel in stiffness, the better hard woods

<sup>1</sup>The elastic limit in this case is somewhat of an arbitrary quantity, namely, the point where 100 pounds produces a deflection 50 per cent greater than the preceding 100 pounds.

develop the greater strength in bending. Like elasticity and stiffness, the strength is expressed in a uniform manner by the so-called "modulus of rupture," to permit ready estimation of the strength of any given piece. This modulus refers to the resistance which the parts most strained, "the extreme fiber," offer. For reasons above stated, in practice a factor of safety is employed, as in all these calculations of resistance. The figures usually tabulated are obtained by the formula:

$$\text{Strength of extreme fiber} = \frac{3 W l}{2 b d^2}$$

where  $W$  is the breaking load,  $l$  the length,  $b$  and  $d$  the breadth and depth of the tested piece of wood.

The following table presents our common woods grouped as to their strength in bending. The load, as before, is supposed to act altogether in the middle. Column 1 gives the strength of the extreme fiber, as explained above; column 2, the number of pounds which will break a piece 1 by 1 inch and 12 inches long, and column 3, the strength of a stick 2 by 2 inches and 10 feet long, from which the strength of any given piece can readily be estimated, allowing, however, for defects, which increase with the size. Thus, if a good piece of pine 2 by 2 inches and 10 feet long breaks with 400 pounds, a 2 by 4 inch set on edge requires 1,600 pounds, a 2 by 6 inch, 3,600 pounds, a 2 by 8 inch piece 6,400 pounds to break it. If a piece 2 by 4 inches and 10 feet long breaks with 1,600 pounds, a 2 by 4 inch and 12 feet long piece breaks with about 1,300 pounds, one 16 feet with 1,000 pounds, etc., and if a factor of safety of 10 is allowed, only one-tenth of the above loads are permissible.

A board one-half inch by 12 inches and 10 feet long contains as much wood as a 2 by 3 inch of the same length, and if placed edgewise should offer four times as much resistance to breaking. Owing to its small breadth, however, it "twists" when loaded, and in most cases, therefore, bears less than the 2 by 3 inch. To prevent this twisting, joists are braced, and the depth of timbers is made not to exceed four times their thickness.

Short deep pieces shear out or split before their strength in bending can fully be called into play.

*Strength in cross-breaking of well-seasoned, select pieces.*

	Strength of the extreme fiber $f = \frac{3 W l}{2 b d^2}$ per square inch.	Approximate weight which breaks a stick—	
		1 by 1 inch and 12 inches long.	2 by 2 inches and 10 feet long.
(1) Robinia (locust), hard maple, hickory, oak, birch, best ash and elm, longleaf, shortleaf, and Cuban pines, tamarack.....	Pounds. 13,000	Pounds. 720	Pounds. 570
(2) Soft maple, cherry, ash, elm, walnut, inferior oak, and birch, best poplar, Norway, loblolly and pitch pines, black and white spruce, hemlock and good cedar.....	10,000	550	440
(3) Tulip, basswood, sycamore, butternut, poplars, white and other soft pines, firs, and cedars.....	6,500	350	280

## TENSION AND COMPRESSION.

When a piece of wood is pulled lengthwise, in the manner shown in fig. 26, part of the fibers are torn asunder or broken, but many are merely pulled or shredded out from between their neighbors. Since failure in tension thus involves lateral adhesion as well as strength of fibers, it is affected not only by the nature and dimensions of the fibers but also by their arrangement. Owing to their transverse position the medullary rays (a large part of all woods) offer but one-tenth to one-twentieth as much resistance as the main body of fibers and moreover weaken the timber by disturbing the straight course of the fibers and the regularity of the entire structure.

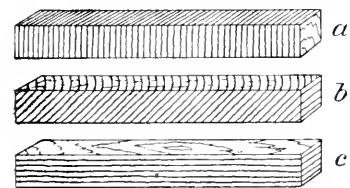


FIG. 27.—Straight and cross grained wood.

which represents the ordinary case of crossgrain, is likewise weakened by the oblique position of the grain.

This explains the detrimental influence of a knot on the underside of a board, as in fig. 28. Since the lower side of the board, in bending, is stretched, the upper side being compressed, the fibers of the lower side are subjected to tension and the wood of the knot, like the piece of crossgrained wood, offers but little resistance. Commonly the defect is greatly increased by a season check in the knot itself, so that the knot affects the strength of the board like a saw cut of equal depth.

The resistance is also much affected by the position of the grain. The perfectly cross-grained piece *a* (fig. 27) sustains but about one-tenth to one-twentieth of the load which is supported by the straight-grained piece *c*, and it is evident that the piece *b*, which represents the ordinary case of crossgrain, is likewise weakened

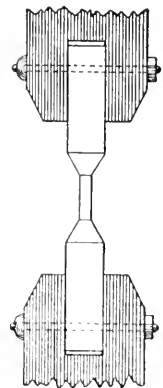


FIG. 26.—Specimen in tension test.

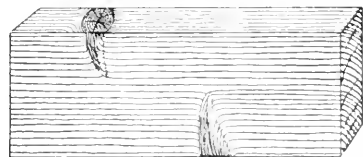


FIG. 28.—Effect of knots and their position.

Tested in compression endwise (fig. 29), the fibers act as so many hollow columns firmly grown together, and when the load becomes too great the piece fails in the manner illustrated in fig. 31. This failure is a very complex phenomenon; in wood like pine the fibers of the plain in which failure occurs become separated into small bodies; they tear apart and cease to behave as one solid body but act as a large number of very small independent pieces. Like the strands of a rope these small bodies offer but little resistance to compression; they bend over, and the piece "buckles."

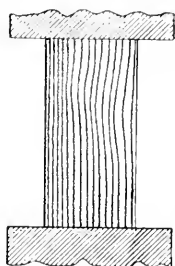


FIG. 29.—Compression endwise.

It is evident that a vertical position and a regular arrangement of the fibers increase the resistance, and that therefore the medullary rays and oblique position of fibers in crossgrained and knotty timber tend to reduce the strength in compression.

From the following table of strength in tension and compression it will be seen that these two are not always proportional, the stiffer conifers excelling in the latter, the tougher hard woods in the former:

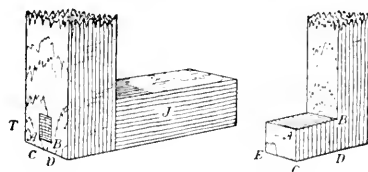


FIG. 30.—Longitudinal shearing.

*Ratio of strength in tension and compression, showing the difference between rigid conifers and tough hard woods.*

	R= Ratio: Tensile strength. compressive strength.	A stick 1 square inch in cross section. Weight required to—	
		Pull apart.	Crush endwise.
		Pounds.	Pounds.
Hickory .....	3.7	32,000	8,500
Elm .....	3.8	29,000	7,500
Larch .....	2.3	19,400	8,600
Longleaf pine .....	2.2	17,300	7,400

*Strength in compression of common American woods in well-seasoned select pieces.*

[Approximate weight per square inch of cross section requisite to crush a piece of wood endwise.]

	Pounds.
(1) Black locust, yellow and cherry birch, hard maple, best hickory, longleaf and Cuban pines, and tamarack .....	9,000+
(2) Common hickory, oak, birch, soft maple, walnut, good elm, best ash, shortleaf and loblolly pines, western hemlock, and Douglas fir .....	7,000+
(3) Ash, sycamore, beech, inferior oak, Pacific white cedar, canoe cedar, Lawson's cypress, common red cedar, cypress, Norway and superior spruces, and fir .....	6,000+
(4) Tulip, basswood, butternut, chestnut, good poplar, white and other common soft pines, hemlock, spruce, and fir .....	5,000+
(5) Soft poplar, white cedar, and some western soft pines, and firs .....	4,000+

## SHEARING.

When, in a structure like that shown in fig. 30, a weight is placed on *J* and the tenon *T* by downward pressure breaks out the piece *A B C D*,

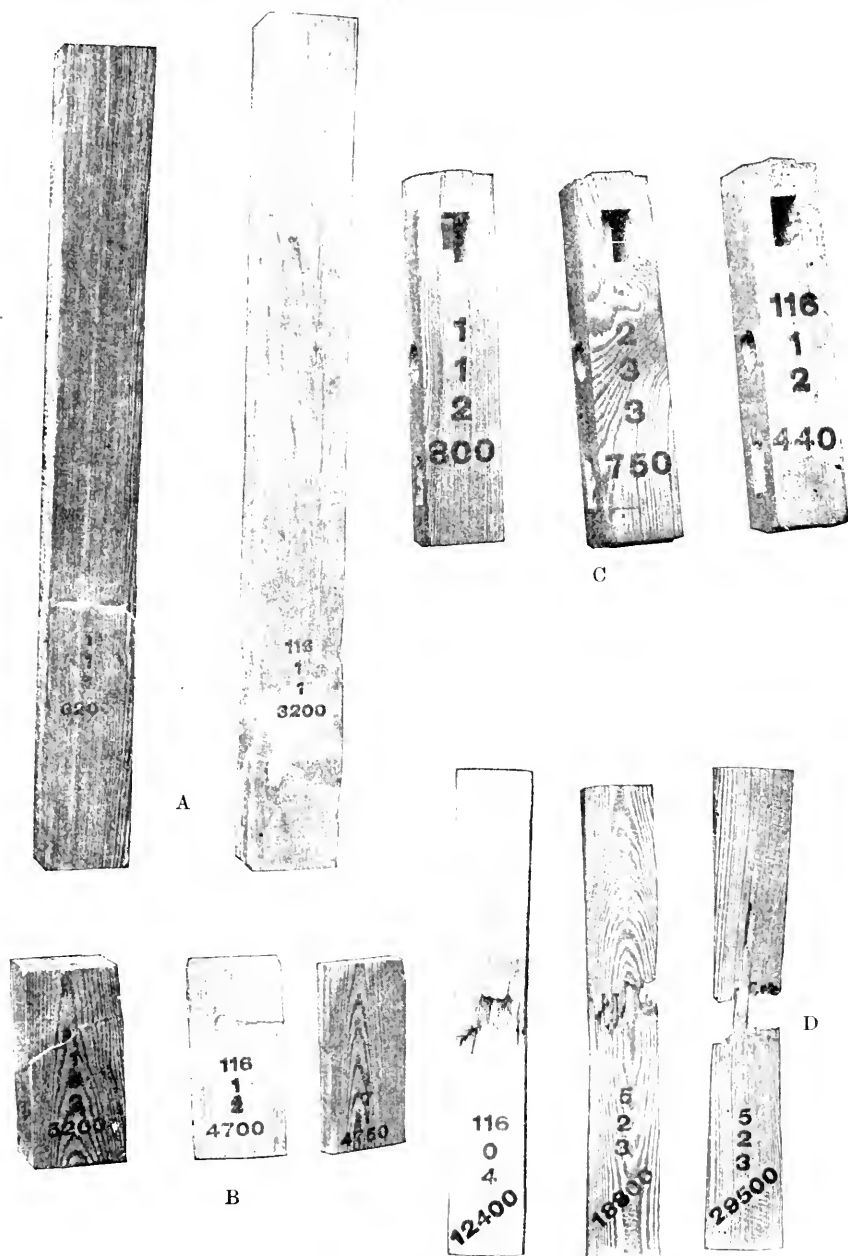


FIG. 31.—Various forms of failure. A and B, compression endwise; C, shearing (the bolt of a stirrup passed through the mortise and sheared out the end), D, tension. The lower figure indicates the number of pounds per square inch which produced the failure in tests by the Division of Forestry. No. 116 (upper figure on each piece) is white pine. Nos. 1, 2, and 5 are longleaf pine, about one-fifth natural size.

this is said to shear out along the fiber. In the same manner, if the shoulder *A B C D* in fig. 30, is pushed off along *B D*, it is sheared, and if *B D* and *C E* are each 1 inch, the surface thus sheared off is 1 square inch, and the weight necessary to do this represents the shearing strength per square inch of the particular kind of wood. This resistance is small when compared to that of tension and compression.

In general wet or green wood shears about one-third more easily than dry wood; a surface parallel to the rings (tangent) shears more easily than one parallel to the medullary rays. The lighter conifers and hard woods offer less resistance than the heavier kinds, but the best of pine shears one-third to one-half more readily than oak or hickory, indicating that great shearing strength is characteristic of "tough" woods.

*Resistance to shearing along the fiber.*

	Per square inch.
	<i>Pounds.</i>
(1) Locust, oak, hickory, elm, maple, ash, birch .....	<sup>1</sup> 1,000
(2) Sycamore, longleaf, Cuban, and shortleaf pine, and tamarack .....	600
(3) Tulip, basswood, better class of poplar, Norway, loblolly and white pine, spruce, red cedar .....	400
(4) Softer poplar, hemlock, white cedar, fir .....	<sup>2</sup> 400

<sup>1</sup> Over.

<sup>2</sup> Less than.

NOTE.—Resistance to shearing, although a most important quality in wood, has not been satisfactorily studied. The values in the above table, taken from various authors, lack a reliable experimental basis and can be considered as only a little better than guesswork.

## INFLUENCE OF WEIGHT AND MOISTURE ON STRENGTH.

It has been stated that heavy wood is stronger than lighter wood of the same kind, and that seasoning increases all forms of resistance. Let us examine why this is so.

Since the weight of dry wood depends on the number of fibers and the thickness of their walls, there must be more fibers per square inch of cross section in the heavy than in the light piece of the same kind,<sup>1</sup> and it is but natural that the greater number of fibers should also offer greater resistance, i. e., have the greater strength.

The beneficial influence of drying and consequent shrinking is twofold: (1) In dry wood a greater number of fibers occur per square inch, and (2) the wood substance itself, i. e., the cell walls, become firmer. A piece of green longleaf pine, 1 by 1 inch and 2 inches long, is only about 0.94 by 0.96 inch and 2 inches long when dry; its cross section is 10 per cent smaller than before, but it still contains the same number of fibers. A dry piece 1 by 1 inch, therefore, contains 10 per cent more fibers than a green piece of the same size, and it is but fair to suppose that its resistance or strength is also about 10 per cent greater.

The influence of the second factor, though unquestionably the more important one, is less readily measured. In 100 cubic inches of wood

<sup>1</sup> This imperfect assumption is used only for comparison.

substance the material of the cell walls takes up about 50 cubic inches of water and thereby swells up, becoming about 150 cubic inches in volume. In keeping with this swelling the substance becomes softer and less resistant. In pine wood this diminution of resistance, according to experiments, seems to be about 50 per cent, and the strength of the substance therefore is inversely as the degree of saturation or solution.

#### HARDNESS AND SHEARING ACROSS THE GRAIN.

When the solid steel plunger P in fig. 32 descends on the piece of wood *w*, the first effect is to press it into the wood of the upper surface without affecting the interior or lower part. The wood is thus tried with regard to its hardness. If a perforated steel plate is substituted for the solid plate the effect of the plunger is at first the same, but soon the fibers some distance from the steel are seen to bend, and finally the piece of wood fails in shearing across the grain. Hardness and shearing across the grain are closely related. The

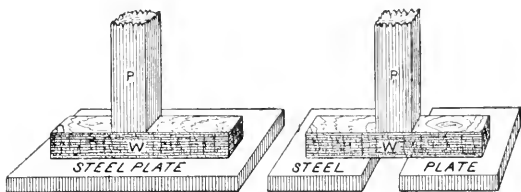


FIG. 32.—Test in hardness and shearing across the grain.

former is the more important quality, however, since abrasion and indentation, the two failures in hardness, are the common cause of loosening of tenons in the mortise, of the handle in the ax, etc.

Heavy wood is harder than lighter wood; the wood of the butt, therefore, is harder than that of the top; the darker summer wood harder than the light-colored spring wood. Moisture softens, and seasoning, therefore, hardens wood.

Placing the rings vertical helps the wood to resist indentation. Though harder wood resists saw and chisel more than softer wood, the working quality of the wood is not always a safe criterion of its hardness.

The following indicates the hardness of our common woods:

1. Very hard woods requiring over 3,200 pounds per square inch to produce an indentation of one-twentieth inch: Hickory, hard maple, osage orange, black locust, persimmon, and the best of oak, elm, and hackberry.

2. Hard woods requiring over 2,400 pounds per square inch to produce an indentation of one-twentieth inch: Oak, elm, ash, cherry, birch, black walnut, beech, blue beech, mulberry, soft maple, holly, sour gum, honey locust, coffee tree, and sycamore.

3. Middling hard woods, requiring over 1,600 pounds per square inch to produce an indentation of one-twentieth inch: The better qualities of Southern and Western hard pine, tamarack and Douglas spruce, sweet gum, and the lighter qualities of birch.

4. Soft woods requiring less than 1,600 pounds per square inch to produce an indentation of one-twentieth inch: The greater mass of coniferous wood; pine, spruce, fir, hemlock, cedar, cypress, and redwood: poplar, tulip, basswood, butternut, chestnut, buckeye, and catalpa.

#### CLEAVABILITY.

When an ax is struck into a piece of wood as shown in fig. 33 the cleft projects beyond the blade of the ax and the process is not one of cutting, but of tension across the grain. The ax presses on a lever, *a b*, while the surface in which the transverse tension takes place is reduced almost to a line across the stick at *b*. If the wood is very elastic, the cleft runs far ahead of the ax, the lever arm *a b* is long, and the resistance to splitting proportionately small. Elasticity, therefore, helps splitting, while great shearing strength, a good measure for transverse tension and hardness hinder it.

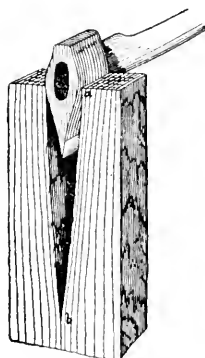


FIG. 33.—Cleavage.

Wood splits naturally along two normal planes, the most readily along the radius, because the arrangement of fibers and pith rays is radial, and next along the tangent, or with the annual rings, because the softer spring wood forms continuous planes in this direction. Cleavage along the radius, however, is from 50 to 100 per cent easier, and only in case of cross grain, etc., the cleavage along the ring becomes the easier. In the wood of conifers, wood fibers and pith rays are very regular, the former in perfect radial series or rows, and cleavage is, therefore, very easy in this direction. The same is brought about in the oak by the

very high pith rays, but where they are thick and low, as in sycamore, and generally in the butt cuts and about knots, they impede cleavage by causing a greater irregularity in the course of the wood fibers. The greater the contrast of spring and summer wood, the easier the cleavage tangentially or in the direction of the rings. This is especially marked in conifers and also in woods like oak, ash, and elm, where the spring wood appears as a continuous series of large pores. Very slow growth influences tangential cleavage, narrow-ringed oak breaks out and splits less regularly even in a radial direction; in conifers, however, this difference scarcely exists. Weight of wood affects the cleavage but little; in heavy wood the entrance of the ax, to be sure, is resisted with more force, but the greater elasticity of the wood, on the other hand, counterbalances this resistance. Irregularities in the course of the fibers, whether spiral growth, crossgrain, or in form of knots, all aid in resisting cleavage. Knotty bolts are split more easily from the upper end, since the cleft then runs around the knots (see p. 23). Moisture softens the wood and reduces lateral adhesion, and therefore wood splits more easily when green than when dry.



## FLEXIBILITY.

Pine is brittle, hickory is flexible; the former breaks, the latter bends. Being the opposite of stiffness, want of stiffness would seem to indicate flexibility. This, however, is only partly true; hickory and ash are stiff and yet among the most flexible of woods. Their small dimensions cause shavings and thin strands of most woods to appear pliable. For this reason the pliable, twisted wicker willow is not a fair measure of the flexibility of the wood of this species. Generally hard woods are more flexible than conifers, wood of the butt surpassing in this respect that of the main part of the stem, the latter being usually superior to that of the limbs. Moisture softens wood and thereby increases its flexibility. Knots and crossgrain diminish flexibility, but the irregular structure of elm, ash, etc. (particularly the arrangement of bodies of extremely firm fibers, like so many strands, among the softer tissue, as well as the interlacement of fibers, due to post-cambial growth), favorably influences the flexibility of these woods.

## TOUGHNESS.

So far the load by which the exhibition of the various kinds of strength in compression, tension, cross bending, etc., was produced has always been assumed as applied slowly and gradually. When a wagon goes lumbering along a cobble pavement the load on the spokes is not thus applied. Every stone deals the wheel a blow, and a mile's journey means many thousand blows to every wheel rim and spoke. In chopping, the ax handle is jarred and a handle made of pine wood, which shears easily along the fiber, would soon be shattered to pieces. Loads thus applied are "shocks," and resistance to this form of loading requires a combination of various kinds of strength possessed only by "tough" woods. Toughness is a familiar word to woodworkers, and yet is rarely defined. Tough wood must be both strong and pliable. Thus a willow is not tough when dry; it is weak and brittle, and requires, notwithstanding its small lateral dimensions, to be moistened and twisted or sheared into still smaller strands so that its fibers are subjected almost exclusively to tension, if great deflection and great strength are to be combined (handles of wicker baskets). Hickory is both strong and pliable; in the dimensions of a willow twig it can be used almost like a rope. The term "tough," therefore, is properly applied to woods like hickory and elm and improperly to willow.

Judging from the behavior of elm and hickory, wood may be pronounced "tough" if it offers great resistance to—

- (1) Longitudinal shearing over 1,000 pounds per square inch,
- (2) Tension over 16,000 pounds per square inch.

and permits, when tested dry, of an aggregate distortion in compression and tension amounting to not less than 3 per cent.

For instance, of a piece of dry hickory (*H. alba*) we may expect—

Strength in shearing.....	pounds..	1,200
Strength in tension.....	do....	25,000
Distortion in tension.....	per cent..	2.03
Distortion in compression.....	do....	1.55
Total distortion.....	do....	3.58

#### PRACTICAL CONCLUSIONS.

From the foregoing considerations a few valuable facts, mostly familiar to the thoughtful woodworker, may be deduced:

In *framing*, where light and stiff timber is wanted, the conifers excel; where heavy but steady loads are to be supported, the heavier conifers, hard pine, spruce, Douglas spruce, etc., answer as well as hard woods, which are costlier and heavier for the same amount of stiffness. On the other hand, if small dimensions must be used, and especially if moving loads are to be sustained, hard woods are safest, and in all cases where the load is applied in form of “shocks” or jars, only the tougher hard woods should be employed. The heavier wood surpasses the lighter of the same species in all kinds of strength, so that the weight of dry wood and the structural features indicative of weight may be used as safe signs in selecting timber for strength.

In *shaping* wood it is better, though more wasteful, to split than to saw, because it insures straight grain and enables a more perfect seasoning.

For *sawed stock* the method of “rift” or “quarter” sawing, which has so rapidly gained favor during the last decade, deserves every encouragement. It permits of better selection and of more advantageous disposition of the wood; rift-sawed lumber is stronger, wears better, seasons well, and is least subject to “working” or warping.

All hardwood material which *checks* or *warps* badly during seasoning should be reduced to the smallest practicable size before drying, to avoid the injuries involved in this process; and wood once seasoned should never again be exposed to the weather, since all injuries due to seasoning are thereby aggravated. Seasoning increases the strength of wood in every respect, and it is therefore of great importance to protect wooden structures, bearing heavy weights, against moisture.

*Knots*, like crossgrain and other defects, reduce the strength of timber. Where choice exists, the knotty side of the joist should be placed uppermost, i. e., should be used in compression.

*Season checks* in timber are always a source of weakness; they are more injurious on the vertical than on the horizontal faces of a stringer or joist, and their effect continues even when they have closed up, as many do, and are no longer visible.

*Rafted timber*, *kiln-dried* or *steamed lumber* are, as far as our present knowledge extends, as strong as other kinds, and wherever any of these

processes aids in a more uniform or perfect seasoning, it increases the strength of the material.

*Pine "bled" for turpentine* is as strong as "unbled."

*Time of felling*, whether season of the year or phase of the moon, does not influence strength, except that summer-felled hard wood rarely seasons as perfectly as that felled in the fall, and to this extent an indirect influence may be observed, as well as by the fact that fungi and insects have a better opportunity for developing.

*Warm countries and sunny exposures* generally produce heavier and stronger timber, and conditions favorable to the growth of the species also improve its quality. But exceptions occur; neither fast nor slow growth is an infallible sign of strong wood, and it is the character of the annual ring, rather than its width, and particularly the proportion of summer wood, which determines the quality of the material.

## VI.—CHEMICAL PROPERTIES OF WOOD.

Wood dried at 300° F. is composed of over 99 per cent of organic and less than 1 per cent of inorganic matter; the latter remains as ashes when wood is burned.

Wood consists of a skeleton of cellulose, permeated by a mixture of other organic substances, collectively designated by the name of lignin, and particles of mineral matter or ashes.

Cellulose is the common substance of which plant cells form their cases or walls; in flax, the entire fiber is almost pure cellulose, but the amount of cellulose obtained from wood, by the common processes, rarely exceeds one-half of its dry weight. Cellulose is identical in composition with starch, but unlike the latter it resists alcoholic fermentation, though the plants themselves, as well as decay-producing fungi, are able to reconvert it into starch, from which it seems originally derived, and also to change it into various forms of sugar.<sup>1</sup> Lignin is as yet a chemical puzzle. The substances forming it are carbohydrates like cellulose itself, but of slightly different proportions and distinguished by greater solubility in acids, and by other chemical properties.

In 100 pounds of wood (dried at 300° F.) and of cellulose the following proportions are found:

	Wood.	Cellulose.
	Pounds.	Pounds.
Carbon .....	49	44.4
Hydrogen .....	6	6.1
Oxygen.....	44	49.3

<sup>1</sup> Chemists have succeeded in producing reversion into grape sugar, and though the methods thus far employed are expensive, it is to be expected that in the near future wood will become the principal source of both vinegar and alcohol.

This composition of wood is fairly uniform for different species.

At ordinary temperatures wood is a very stable compound; both in air and under water it remains the same for centuries, and only when living organisms attack it with their strong solvents and convertants do change and decay set in.

Heated to 300° F. wood gives off only water, though some slight chemical changes are noticeable even at this temperature. If the heat is increased, gases of pungent odor and taste are evolved, and if the temperature is sufficiently raised, the gases are ignited, forming the flame of the fire, while the remaining solid part glows like an ignited charcoal, giving much heat, but no flame. The amount of heat produced by wood varies. If first dried at 300° F., 100 pounds of poplar wood should give as much heat as 100 pounds of hickory. In the natural state, however, this is not the case. .

The beneficial effect of thorough seasoning for firewood appears from the following consideration:

One hundred pounds of wood as sold in the wood yards contains in round numbers 25 pounds of water, 74 pounds of wood, and 1 pound of ashes.

The 74 pounds of wood are composed of 37 pounds of carbon, 4.4 pounds of hydrogen, and 32 pounds of oxygen.

In burning (which is a process of oxidation) 4 pounds of hydrogen are already combined with 32 pounds of oxygen and there are only the 37 pounds of carbon and 0.4 pounds of hydrogen available in heat production. Thus only about one-half the weight of the wood substance itself is heat producing while every pound of water combined in the wood requires about 600 units of heat to evaporate it, and thus diminishes the value of the wood as fuel. Hence under the most favorable circumstances 100 pounds of green wood (50 per cent moisture) furnishes about 150,000 units<sup>1</sup> of heat; 100 pounds of half dry (30 per cent moisture) about 230,000 units; 100 pounds of air dry (20 per cent moisture) about 280,000 units; 100 hundred pounds of air dry (10 per cent moisture) about 320,000 units; 100 pounds of kiln-dry (2 per cent moisture) about 350,000 units.

In the ordinary stove or other small apparatus the evil effect of moisture in the wood is very much increased since combustion is materially interfered with.

One hundred pounds of ordinary charcoal furnishes 700,000 units of heat but the same quantity of charcoal produced at a temperature of 2,000° F. furnishes nearly 800,000 units of heat.

Conifers and the lighter hard woods produce more flame, while the heavy hard woods furnish a good bed of live coal and exceed the former by 25 to 30 per cent in production of heat with ordinary appliances.

<sup>1</sup>A unit of heat in this case is the amount of heat which raises the temperature of 1 pound of water by 1.8° F. or 1° C.

Heated in a closed chamber or covered with earth, as in charcoal pits, the wood is prevented from burning and a variety of changes occur, depending on the rate of heating. If the temperature is raised gradually so that the wood is heated several hours before a temperature of 600° F. is reached the process is called dry distillation. In this process the wood is destroyed. It forms at first "red" or "brown" coal, still resembling wood, and finally charcoal proper. This coal is darker, heavier, conducts heat and electricity better, requires a greater heat to ignite, and produces more heat in burning the higher the temperature under which it is formed.

One hundred pounds of wood (dried at 300° F.) leaves only about 30 pounds of charcoal. In common practice much less charcoal (18 to 20 per cent) is produced. In this change from wood to coal the volume is diminished by about one-half, so that a cord of wood which contains about 100 cubic feet of wood solid would be converted into 50 cubic feet at best.

Of the 70 pounds of gaseous products which 100 pounds of wood lose, during coaling, in being heated up to 700° F., about 63 pounds become volatile before the temperature of 550° F. is reached.

If condensed in a cooler, about three-fourths of the 63 pounds of volatile matter first evolved is found to be wood-vinegar, from which about 4 pounds of pure acetic acid, the only source of perfectly pure vinegar, is obtained. Besides acetic acid, the liquid contains wood spirits and a quantity of various allied substances.

After the first stage of dry distillation, a large part of the products developed can not be liquefied in the ordinary cooler. They are gases like the illuminating gas, mostly belonging to the marsh gas series; they lack oxygen and thus show that the available oxygen has been nearly exhausted in the preceding part of the process. Products of the later stages are tars and heavy oils, volatile only at high temperatures. Here also belong the substances known collectively as wood creosote, employed as antiseptics in wood impregnation.

Warmed in dilute nitric acid with a little chlorate of potash, the cells of a piece of wood may be separated, each cell remains intact, but its wall is reduced in thickness and material: the lignin substances being dissolved out, only the cellulose is left. In commercial cellulose manufacture, soda, sulphates, and of late chiefly sulphites are substituted for the nitric acid. The wood is chipped, boiled in the respective solution under high pressures, the residue is washed, and the remaining cellulose bleached and ready for use. As a matter of economy the residual liquid is evaporated and the soda used over again.

When resinous wood, "fat pine," "lightwood," such as the knots and stumps of longleaf, pitch, and other pines, is heated in a kiln or retort, the resins ooze out, are collected, and in distillation with steam yield turpentine and rosin. The resins and their components vary with the species; the balsam of fir is limpid, its turpentine remains clear on

exposure; the resin of pines is very viscid, their turpentine readily oxidize and darken when brought in contact with air. Resins are gathered more commonly either from cracks, such as "wind" and "ring shakes," as in the case of larch and fir (Venetian turpentine), or else from wounds made especially for this purpose, as in the case of naval stores gathered from pines. This latter process is known as "bleeding," "tapping," or "orcharding," and is at present the principal method of obtaining turpentine and rosins.

On burning resinous wood, wood tar, etc., in a smoldering fire, soot is deposited on the walls and partitions of the specially constructed soot pit. It is then collected, but must be freed of various products of dry distillation, by carefully heating to red heat before it becomes the lampblack used in printers' ink and otherwise much employed in the arts.

Many kinds of wood and the bark of most trees contain tannin. To serve in tanning the bark must contain at least 3 per cent of tannin: the kinds mostly used vary from 5 to 15 per cent, and even the best probably never furnish over 20 per cent in the average. The use of tan bark involves considerable disadvantages. It is difficult to dry and preserve, very liable to mold, bulky, and therefore expensive to ship and store, and very variable in the amount of tannin which it contains.

To avoid these difficulties the tannic compounds are, in recent times, leached out of the finely ground bark and wood, condensed by evaporation, and shipped as extracts containing 80 to 90 per cent of tannin.

The manufacture of pulp as well as the production of fiber capable of being spun and woven, are also technological uses of wood, which rely partly upon chemical reactions.

## VII.—DURABILITY AND DECAY.

All wood is equally durable under certain conditions. Kept dry or submerged, it lasts indefinitely. Pieces of pine have been unearthed in Illinois which have lain buried 60 or more feet deep for many centuries. Deposits of sound logs of oak, buried for unknown ages, have been unearthed in Bavaria: parts of the piles of the lake dwellers, driven more than two thousand years ago, are still intact.

On the radial section of a piece of pine timber, with one of the shelf-like, fungus growths, as shown in fig. 34, both bark and wood are seen to be affected. A small particle of the half-decayed wood presents pictures like that of fig. 35. Slender, branching threads are seen to attach themselves closely to the walls of the cells, and to pierce these in all directions. Thus these little threads of fungus mycelium soon form a perfect network in the wood, and as they increase in number they dissolve the walls, and convert the wood substance and cell contents into sugar-like food for their own consumption. In some cases it is the woody cell wall alone that is attacked. In other cases they

confine themselves to eating up the starch found in the cells, as shown in fig. 36, and merely leave a stain (bluing of lumber). In all cases of decay we find the vegetative bodies, these slender threads of fungi, responsible for the mischief. These fine threads are the vegetative body of the fungus, the little shelf is its fruiting body, on which it produces myriads of little spores (the seeds of fungi). Some fungi attack only conifers, others hard woods; many are confined to one species of tree and perhaps no one attacks all kinds of wood. One kind produces "red rot," others "bluing." In one case the decayed tracts are tubular,

and in the direction of the fibers the wood is "peggy." In other cases no particular shapes are discernible.

Cutting off a disk of loblolly pine, washing it, and then laying it in a clean, shady place in the sawmill, its sapwood will be found stained in a few days. Nor is this mischief confined to the surface;

it penetrates the sapwood of the entire disk. From this it appears that the spores must have been in the air about the mill, and also that their germination and the growth of the threads or mycelium is exceedingly rapid. (Watching the progress of mold on a piece of bread teaches the same thing.) Placing a fresh piece of sapwood on ice, another into a dry kiln, and soaking a few others in solutions of corrosive sublimate (mercuric chloride) and other similar salts, we learn that the fungus growth is retarded by cold, prevented and killed by temperatures over 150° F., and that salts of mercury, etc., have the same effect. The fact that seasoned pieces if exposed are not so readily attacked by fungi shows that the moisture in air-dry wood is insufficient for fungus growth.

From this it appears that warmth, preferably between 60° and 100° F., combined with abundance of moisture (but not immersion), is the most important condition favoring decay, and that the defense lies in the proper regulation or avoidance of these

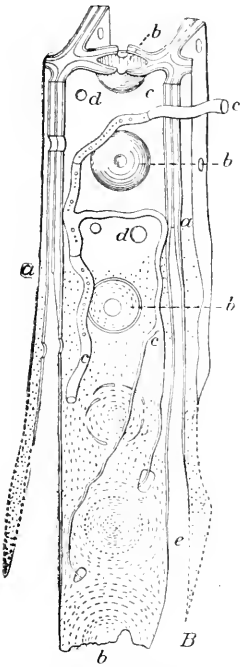


FIG. 35.—Fungus threads in pine wood. (Hartig.) *a*, cell wall of the wood fibers; *b*, bordered pits of these fibers; *c*, thread of mycelium of the fungus; *d*, holes in the cell walls made by the fungus threads, which gradually dissolve the walls as shown at *e*, and thus break down the wood structure.

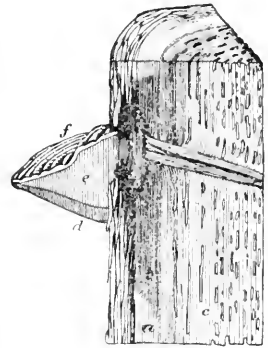


FIG. 34.—"Shelf" fungus on the stem of a pine. (Hartig.) *a*, sound wood; *b*, resinous "light" wood; *c*, partly decayed wood or punk; *d*, layer of living spore tubes; *e*, old filled up spore tubes; *f*, fluted upper surface of the fruiting body of the fungus, which gets its food through a great number of fine threads (the mycelium), its vegetative tissue penetrating the wood and causing its decay.

conditions, or else in the use of poisonous salts, which prevent the propagation of fungi.

It is also apparent, therefore, why wood decays faster in Alabama than in Wisconsin, faster in the swamps than on the plains, and why the presence of large quantities of decaying wood about the yard, constantly producing fresh supplies of spores, stimulates decay. Covering with tar or impregnating with creosote, salts of mercury, copper, etc., enables even sapwood to last under the most trying conditions. Contact with the ground assures most favorable moisture conditions for fungus growth, and the higher temperatures near the surface of the ground, together with the ever-present supply of spores, cause rot in a post to start at the surface more readily than 30 inches below.

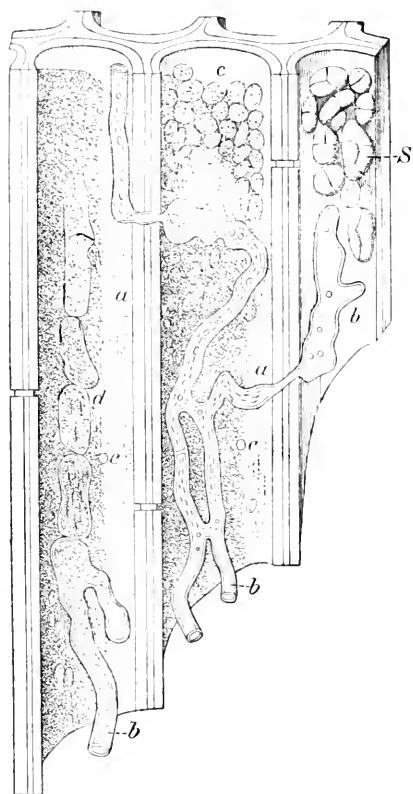


FIG. 36.—Cells of maple wood attacked by fungus threads (*Nectria cinnabarina* Mayer). Section of three wood fibers showing the threads of the fungus branching in their cavities and consuming the starch stored in these cells. *a*, interior or cavity of cells; *b*, threads of the fungus; *c*, partly destroyed starch grains; *d*, dead portions of the fungus thread together with debris; *e*, holes bored by the fungus through the cell walls; *s*, starch grains just being attacked.

coal resists the solvents of fungi, charring the outer parts of posts makes, if well done, namely, so as not to open checks into the interior of the wood, a very fine protection.

Under ordinary circumstances, only the second great factor of decay, i. e., the moisture condition, can be controlled.

The use of means to prevent decay is therefore desirable where timber is placed in positions favorable to fungus growth, as in railway ties; and all joists and timber in contact with damp brick walls, as also all building material whose perfect seasoning is prevented by the absence of proper circulation of air, should be specially protected. In the former cases it is economy to apply preservative processes; in the latter a sanitary necessity. Wood covered with paint, etc., before it is perfectly seasoned, falls a prey to "dry rot;" the fungus finds abundance of moisture, and the protection intended for the wood protects its enemy, the fungus. Since charcoal resists the solvents of fungi, charring the outer parts of posts makes, if well done, namely, so as not to open checks into the interior of the wood, a very fine protection.

Under ordinary circumstances, only the second great factor of decay, i. e., the moisture condition, can be controlled.



Perfect seasoning, preferably kiln-drying, before using, and protection against the entrance of moisture by tar, paints, and other covers, when put in place, prolong the life of wooden structures. Where such a covering is too expensive, good ventilation at least is necessary. Contact surfaces, where timber rests on timber or brick, should in all cases be especially protected.

Different species differ in their resistance to decay. Cedar is more durable than pine and oak better than beech, but in most cases the conditions of warmth and moisture in particular locations have so much to do with durability that often an oak post outlasts one of cedar, even in the same line of fence, and predictions of durability become mere guesswork.

Containing more ready-made food, and in forms acceptable to a great number of different kinds of fungi, the sapwood is more subject to decay than the heartwood, doubly so where the latter is protected by resinous substances, as in pine and cedar. Several months of immersion improves the durability of sapwood, but only impregnation with preservative salts seems to render it perfectly secure. Once attacked by fungi, wood becomes predisposed to further decay.

Wood cut in the fall is more durable than that cut in summer, only because the low temperature of the winter season prevents the attack of the fungi, and the wood is thus given a fair chance to dry. Usually summer-felled wood, on account of prevalent high temperature and exposure to sun, checks more than winter-felled wood, and since all season checks favor the entrance of both moisture and fungus, they facilitate destruction. Where summer-felled wood is worked up at once and protected by kiln-drying no difference exists. The phases of the moon have no influence whatever on durability.

In sawing timber much of the wood is bastard cut; at these places water enters much more readily, and for this reason split and hewn timber and ties generally resist decay perhaps better than if sawed.

The attacks of beetles, as well as those of the shipworm, can not here be considered; like chisel or saw they are mechanical injuries against which none of our woods are proof.

*Range of durability in railroad ties.*

	Years.		Years.
White oak and chestnut oak.....	8	Redwood.....	12
Chestnut.....	8	Cypress and red cedar.....	10
Black locust.....	10	Tamarack.....	7 to 8
Cherry, black walnut, locust.....	7	Longleaf pine.....	6
Elm.....	6 to 7	Hemlock.....	4 to 6
Red and black oaks.....	4 to 5	Spruce.....	5
Ash, beech, maple.....	4		

The durability of wood, exposed to the changes of the weather, and where painting, after thorough seasoning, is impracticable, is increased

by impregnating it with various salts or other chemicals, which prevent the fungus from feeding on the wood. The wood is first steamed, to open the pores and remove the hardened surface coating of sap and dirt, and a liquid solution of the preservative material is then injected with the assistance of heat and pressure.

The most efficient fluids used on a large scale are bichloride of zinc and creosote, or both combined. The "life" of railroad ties is thereby increased to twice and three times its natural duration.

## HOW TO DISTINGUISH THE DIFFERENT KINDS OF WOOD.

By B. E. FERNOW and FILIBERT ROTH.

The carpenter or other artisan who handles different woods becomes familiar with those he employs frequently, and learns to distinguish them through this familiarity, without usually being able to state the points of distinction. If a wood comes before him with which he is not familiar, he has, of course, no means of determining what it is, and it is possible to select pieces even of those with which he is well acquainted, different in appearance from the general run, that will make him doubtful as to their identification. Furthermore, he may distinguish between hard and soft pines, between oak and ash, or between maple and birch, which are characteristically different; but when it comes to distinguishing between the several species of pine or oak or ash or birch, the absence of readily recognizable characters is such that but few practitioners can be relied upon to do it. Hence, in the market we find many species mixed and sold indiscriminately.

To identify the different woods it is necessary to have a knowledge of the definite, invariable differences in their structure, besides that of the often variable differences in their appearance. These structural differences may either be readily visible to the naked eye or with a magnifier, or they may require a microscopical examination. In some cases such an examination can not be dispensed with, if we would make absolutely sure. There are instances, as in the pines, where even our knowledge of the minute anatomical structure is not yet sufficient to make a sure identification.

In the following key an attempt has been made—the first, so far as we know, in English literature—to give a synoptical view of the distinctive features of the commoner woods of the United States, which are found in the markets or are used in the arts. It will be observed that the distinction has been carried in most instances no further than to genera or classes of woods, since the distinction of species can hardly be accomplished without elaborate microscopic study, and also that, as far as possible, reliance has been placed only on such characteristics as can be distinguished with the naked eye or a simple magnifying glass, in order to make the key useful to the largest number. Recourse has also been taken for the same reason to the less reliable and more variable general external appearance, color, taste, smell, weight, etc.

The user of the key must, however, realize that external appearance, such, for example, as color, is not only very variable but also very difficult to describe, individual observers differing especially in seeing and

describing shades of color. The same is true of statements of size, when relative, and not accurately measured, while weight and hardness can perhaps be more readily approximated. Whether any feature is distinctly or only indistinctly seen will also depend somewhat on individual eyesight, opinion, or practice. In some cases the resemblance of different species is so close that only one other expedient will make distinction possible, namely, a knowledge of the region from which the wood has come. We know, for instance, that no longleaf pine grows in Arkansas and that no white pine can come from Alabama, and we can separate the white cedar, giant arbor vitae of the West and the arbor vitae of the Northeast, only by the difference of the locality from which the specimen comes. With all these limitations properly appreciated, the key will be found helpful toward greater familiarity with the woods which are more commonly met with.

The features which have been utilized in the key and with which—their names as well as their appearance—therefore, the reader must familiarize himself before attempting to use the key, are mostly described as they appear in cross section. They are:

(1) Sapwood and heartwood (see p. 13), the former being the wood from the outer and the latter from the inner part of the tree. In some

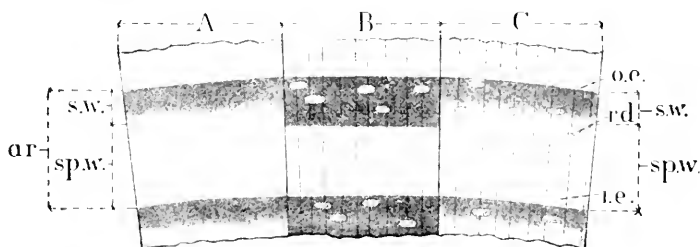


FIG. 37.—“Non-porous” woods. *A*, fir; *B*, “hard” pine; *C*, soft pine; *ar*, annual ring; *o. e.*, outer edge of ring; *i. e.*, inner edge of ring; *s. w.*, summer wood; *sp. w.*, spring wood; *rd*, resin ducts.

cases they differ only in shade, and in others in kind of color, the heartwood exhibiting either a darker shade or a pronounced color. Since one can not always have the two together, or be certain whether he has sapwood or heartwood, reliance upon this feature is, to be sure, unsatisfactory, yet sometimes it is the only general characteristic that can be relied upon. If further assurance is desired, microscopic structure must be examined; in such cases reference has been made to the presence or absence of tracheids in pith rays and the structure of their walls, especially projections and spirals.

(2) Annual rings, their formation having been described on page 14. (See also figs. 37–39.) They are more or less distinctly marked, and by means of such marking a classification of three great groups of wood is possible.

(3) Spring wood and summer wood, the former being the interior (first formed wood of the year), the latter the exterior (last formed) part

of the ring. The proportion of each and the manner in which the one merges into the other are sometimes used, but more frequently the manner in which the pores appear distributed in either.

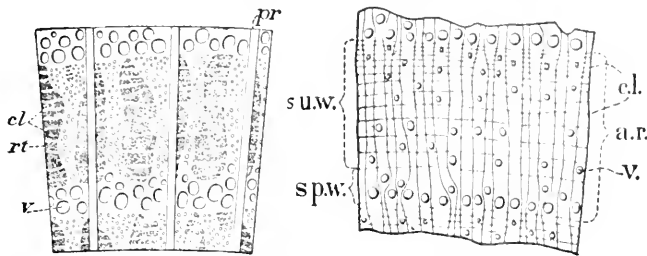


FIG. 38.—“Ring-porous” woods—white oak and hickory. *a. r.*, annual ring; *su. w.*, summer wood; *sp. w.*, spring wood; *v.*, vessels or pores; *c. l.*, “concentric” lines; *rt.*, darker tracts of hard fibers forming the firm part of oak wood; *pr.*, pith rays.

(4) Pores, which are vessels cut through, appearing as holes in cross section, in longitudinal section as channels, scratches, or indentations. (See p. 19 and figs. 38 and 39.) They appear only in the broad-leaved, so called, hard woods; their relative size (large, medium, small, minute, and indistinct, when they cease to be visible individually by the naked eye) and manner of distribution in the ring being of much importance, and especially in the summer wood, where they appear singly, in groups, or short broken lines, in continuous concentric, often wavy, lines, or in radial branching lines.

(5) Resin ducts (see p. 16 and fig. 37), which appear very much like pores in cross section, namely, as holes or lighter or darker colored dots, but much more scattered. They occur only in coniferous woods, and their presence or absence, size, number, and distribution are an important distinction in these woods.

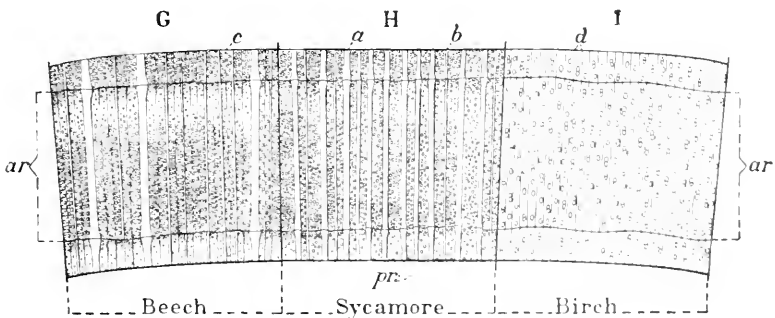


FIG. 39.—“Diffuse-porous” woods. *ar.*, annual ring; *pr.*, pith rays which are “broad” at *a*, “fine” at *b*, “indistinct” at *d*.

(6) Pith rays (see p. 17 and figs. 38 and 39), which in cross section appear as radial lines, and in radial section as interrupted bands of varying breadth, impart a peculiar luster to that section in some woods. They are most readily visible with the naked eye or with a magnifier in the

broad-leaved woods. In coniferous woods they are usually so fine and closely packed that to the casual observer they do not appear. Their breadth and their greater or less distinctness are used as distinguishing marks, being styled fine, broad, distinct, very distinct, conspicuous, and indistinct when no longer visible by the naked (strong) eye.

(7) Concentric lines, appearing in the summer wood of certain species more or less distinct, resembling distantly the lines of pores but much finer and not consisting of pores. (See fig. 38.)

Of microscopic features, the following only have been referred to:

(8) Tracheids, a description of which is to be found on page 20.

(9) Pits, simple and bordered, especially the number of simple pits in the cells of the pith rays, which lead into each of the adjoining tracheids.

For standards of weight, consult table on page 28; for standards of hardness, table on page 47.

Unless otherwise stated the color refers always to the fresh cross section of a piece of dry wood; sometimes distinct kinds of color, sometimes only shades, and often only general color effects appear.

#### HOW TO USE THE KEY.

Nobody need expect to be able to use successfully any key for the distinction of woods or of any other class of natural objects without some practice. This is especially true with regard to woods, which are apt to vary much, and when the key is based on such meager general data as the present. The best course to adopt is to supply one's self with a small sample collection of woods, accurately named. Small, polished tablets are of little use for this purpose. The pieces should be large enough, if possible, to include pith and bark, and of sufficient width to permit ready inspection of the cross section. By examining these with the aid of the key, beginning with the better-known woods, one will soon learn to see the features described and to form an idea of the relative standards which the maker of the key had in mind. To aid in this, the accompanying illustrations will be of advantage. When the reader becomes familiar with the key, the work of identifying any given piece will be comparatively easy. The material to be examined must, of course, be suitably prepared. It should be moistened; all cuts should be made with a very sharp knife or razor and be clean and smooth, for a bruiséd surface reveals but little structure. The most useful cut may be made along one of the edges. Instructive, thin, small sections may be made with a sharp penknife or razor, and when placed on a piece of thin glass, moistened and covered with another piece of glass, they may be examined by holding them toward the light.

Finding, on examination with the magnifier, that it contains pores, we know it is not coniferous or nonporous. Finding no pores collected in the spring-wood portion of the annual ring, but all scattered (diffused) through the ring, we turn at once to the class of "Dif-

fuse-porous woods." We now note the size and manner in which the pores are distributed through the ring. Finding them very small and neither conspicuously grouped, nor larger nor more abundant in the spring wood, we turn to the third group of this class. We now note the pith rays, and finding them neither broad nor conspicuous, but difficult to distinguish, even with the magnifier, we at once exclude the wood from the first two sections of this group and place it in the third, which is represented by only one kind, cottonwood. Finding the wood very soft, white, and on the longitudinal section with a silky luster, we are further assured that our determination is correct. We may now turn to the list of woods and obtain further information regarding the occurrence, qualities, and uses of the wood.

Sometimes our progress is not so easy; we may waver in what group or section to place the wood before us. In such cases we may try each of the doubtful roads until we reach a point where we find ourselves entirely wrong and then return and take up another line; or we may anticipate some of the later-mentioned features and finding them apply to our specimen, gain additional assurance of the direction we ought to travel. Color will often help us to arrive at a speedy decision. In many cases, especially with conifers, which are rather difficult to distinguish, a knowledge of the locality from which the specimen comes is at once decisive. Thus, northern white cedar, and bald cypress, and the cedar of the Pacific will be identified, even without the somewhat indefinite criteria given in the key.

# KEY TO THE MORE IMPORTANT WOODS OF NORTH AMERICA.

[The numbers preceding names refer to the List of Woods following the Key.]

**I Non-porous woods.**—Pores not visible or conspicuous on cross section, even with magnifier. Annual rings distinct by denser (dark colored) bands of summer wood (fig. 37).

**II. Ring-porous woods.**—Pores numerous, usually visible on cross section with out magnifier. Annual rings distinct by a zone of large pores collected in the spring wood, alternating with the denser summer wood (fig. 38).

**III. Diffuse-porous woods.**—Pores numerous, usually not plainly visible on cross section without magnifier. Annual rings distinct by a fine line of denser summer wood cells, often quite indistinct; pores scattered through annual ring, no zone of collected pores in spring wood (fig. 39).

NOTE.—The above described three groups are exogenous, i. e., they grow by adding annually wood on their circumference. A fourth group is formed by the endogenous woods, like yuccas and palms, which do not grow by such additions.

## I.—NON-POROUS WOODS.

(Includes all coniferous woods.)

### A. Resin ducts wanting.<sup>1</sup>

#### 1. No distinct heartwood.

a. Color effect yellowish white; summer wood darker yellowish (under microscope pith ray without tracheids).....(Nos. 9-13) FIRS.

b. Color effect reddish (roseate) (under microscope pith ray with tracheids),  
(Nos. 14 and 15) HEMLOCK.

#### 2. Heartwood present, color decidedly different in kind from sapwood.

a. Heartwood light orange red; sapwood, pale lemon; wood, heavy and hard .....(No. 38) YEW.

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### ADDITIONAL NOTES FOR DISTINCTIONS IN THE GROUP.

Spruce is hardly distinguishable from fir, except by the existence of the resin ducts, and microscopically by the presence of tracheids in the medullary rays. Spruce may also be confounded with soft pine, except for the heartwood color of the latter and the larger, more frequent, and more readily visible resin ducts.

In the lumber yard, hemlock is usually recognized by color and the slivery character of its surface. Western hemlocks partake of this last character to a less degree.

Microscopically the white pine can be distinguished by having usually only one large pit, while spruce shows three to five very small pits in the parenchyma cells of the pith ray communicating with the tracheid.

The distinction of the pines is possible only by microscopic examination. The following distinctive features may assist in recognizing, when in the log or lumber pile, those usually found in the market:

The light, straw color, combined with great lightness and softness, distinguishes the white pines (white pine and sugar pine) from the hard pines (all others in the market), which may also be recognized by the gradual change of spring wood into summer wood. This change in hard pines is abrupt, making the summer wood appear as a sharply defined and more or less broad band.

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<sup>1</sup>To discover the resin ducts a very smooth surface is necessary, since resin ducts are frequently seen only with difficulty, appearing on the cross section as fine whiter or darker spots normally scattered singly, rarely in groups, usually in the summer wood of the annual ring. They are often much more easily seen on radial, and still more so on tangential sections, appearing there as fine lines or dots of open structure of different color or as indentations or pin scratches in a longitudinal direction.



- b.* Heartwood purplish to brownish red; sapwood yellowish white; wood soft to medium hard light, usually with aromatic odor. (No. 6) RED CEDAR.
- c.* Heartwood maroon to terra cotta or deep brownish red; sapwood light orange to dark amber, very soft and light, no odor; pith rays very distinct, specially pronounced on radial section. (No. 7) REDWOOD.
- 3. Heartwood present, color only different in shade from sapwood, dingy-yellowish brown.
  - a.* Odorless and tasteless. (No. 8) BALD CYPRESS.
  - b.* Wood with mild resinous odor, but tasteless. (Nos. 1-4) WHITE CEDAR.
  - c.* Wood with strong resinous odor and peppery taste when freshly cut. (No. 5) INCENSE CEDAR.
- B. Resin ducts present.
  - 1. No distinct heartwood; color white, resin ducts very small, not numerous, (Nos. 33-36) SPRUCE.
  - 2. Distinct heartwood present.
    - a.* Resin ducts numerous, evenly scattered through the ring.
      - a'.* Transition from spring wood to summer wood gradual; annual ring distinguished by a fine line of dense summer-wood cells; color, white to yellowish red; wood soft and light. (Nos. 18-21) SOFT PINES.<sup>1</sup>
      - b'.* Transition from spring wood to summer wood more or less abrupt; broad bands of dark-colored summer wood; color from light to deep orange; wood medium hard and heavy. (Nos. 22-32) HARD PINES.<sup>1</sup>
    - b.* Resin ducts not numerous nor evenly distributed.
      - a'.* Color of heartwood orange-reddish, sapwood yellowish (same as hard pine); resin ducts frequently combined in groups of 8 to 30, forming lines on the cross section (tracheids with spirals), (No. 37) DOUGLAS SPRUCE.
      - b'.* Color of heartwood light russet brown; of sapwood yellowish brown; resin ducts very few, irregularly scattered (tracheids without spirals). (Nos. 16 and 17) TAMARACK.

The Norway pine, which may be confounded with the shortleaf pine, can be distinguished by being much lighter and softer. It may also, but more rarely, be confounded with heavier white pine, but for the sharper definition of the annual ring, weight, and hardness.

The longleaf pine is strikingly heavy, hard, and resinous, and usually very regular and narrow ringed, showing little sapwood, and differing in this respect from the shortleaf pine and loblolly pine, which usually have wider rings and more sapwood, the latter excelling in that respect.

The following convenient and useful classification of pines into four groups, proposed by Dr. H. Mayr, is based on the appearance of the pith ray as seen in a radial section of the spring wood of any ring:

Section I. Walls of the tracheids of the pith ray with dentate projections.

- a.* One to two large, simple pits to each tracheid on the radial walls of the cells of the pith ray.—Group 1. Represented in this country only by *P. resinosa*.
- b.* Three to six simple pits to each tracheid, on the walls of the cells of the pith ray.—Group 2. *P. taeda*, *palustris*, etc., including most of our "hard" and "yellow" pines.

Section II. Walls of tracheids of pith ray smooth, without dentate projections.

- a.* One or two large pits to each tracheid on the radial walls of each cell of the pith ray.—Group 3. *P. strobus*, *lambertiana*, and other true white pines.
- b.* Three to six small pits on the radial walls of each cell of the pith ray.
  - Group 4. *P. parryana*, and other nut pines, including also *P. balfouriana*.

<sup>1</sup> Soft and hard pines are arbitrary distinctions and the two not distinguishable at the limit.

**II.—RING-POROUS WOODS.**

[Some of Group D and cedar elm imperfectly ring-porous.]

A. Pores in the summer wood minute, scattered singly or in groups, or in short broken lines, the course of which is never radial.

1. Pith rays minute, scarcely distinct.

a. Wood heavy and hard; pores in the summer wood not in clusters.

a' Color of radial section not yellow.....(Nos. 39-41) ASH.

b' Color of radial section light yellow; by which, together with its hardness and weight, this species is easily recognized..(No. 103) OSAGE ORANGE.

b. Wood light and soft; pores in the summer wood in clusters of 10 to 30,  
(No. 56) CATALPA.

2. Pith rays very fine, yet distinct; pores in summer wood usually single or in short lines; color of heartwood reddish brown; of sapwood yellowish white; peculiar odor on fresh section .....(No. 111) SASSAFRAS.

3. Pith rays fine, but distinct.

a. Very heavy and hard; heartwood yellowish brown. (No. 77) BLACK LOCUST.

b. Heavy; medium hard to hard.

a' Pores in summer wood very minute, usually in small clusters of 3 to 8; heartwood light orange brown ..... (No. 83) RED MULBERRY.

b' Pores in summer wood small to minute, usually isolated; heartwood cherry red..... (No. 61) COFFEE TREE.

**ADDITIONAL NOTES FOR DISTINCTIONS IN THE GROUP.**

Sassafras and mulberry may be confounded but for the greater weight and hardness and the absence of odor in the mulberry; the radial section of mulberry also shows the pith rays conspicuously.

Honey locust, coffee tree, and black locust are also very similar in appearance. The honey locust stands out by the conspicuousness of the pith rays, especially on radial sections, on account of their height, while the black locust is distinguished by the extremely great weight and hardness, together with its darker brown color.

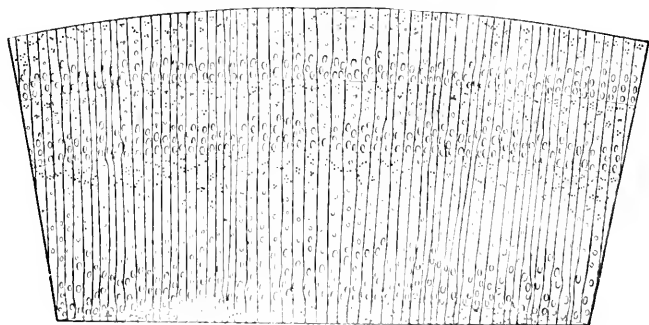


FIG. 10. —Wood of coffee tree

The ashes, elms, hickories, and oaks may, on casual observation, appear to resemble one another on account of the pronounced zone of porous spring wood. The sharply defined large pith rays of the oak exclude these at once; the wavy lines of pores in the summer wood, appearing as conspicuous finely-feathered hatchings on tangential section, distinguish the elms; while the ashes differ from the hickory by the very conspicuously defined zone of spring wood pores, which in hickory appear more or less interrupted. The reddish hue of the hickory and the more or less brown hue of the ash may also aid in ready recognition. The smooth, radial surface of split hickory will readily separate it from the rest.

4. Pith rays fine but very conspicuous, even without magnifier. Color of heartwood red; of sapwood pale lemon ..... (No. 78) HONEY LOCUST.
- B. Pores of summer wood minute or small, in concentric wavy and sometimes branching lines, appearing as finely-feathered hatchings on tangential section.
  1. Pith rays fine, but very distinct; color greenish white. Heartwood absent or imperfectly developed. .... (No. 70) HACKBERRY.
  2. Pith rays indistinct; color of heartwood reddish brown; sapwood grayish to reddish white. .... (Nos. 62-66) ELMS.
- C. Pores of summer wood arranged in radial branching lines (when very crowded radial arrangement somewhat obscured).
  1. Pith rays very minute, hardly visible. .... (Nos. 58-60) CHESTNUT.
  2. Pith rays very broad and conspicuous. .... (Nos. 81-102) OAK.
- D. Pores of summer wood mostly but little smaller than those of the spring wood, isolated and scattered; very heavy and hard woods. The pores of the spring wood sometimes form but an imperfect zone. (Some diffuse-porous woods of groups A and B may seem to belong here.)
  1. Fine concentric lines (not of pores) as distinct, or nearly so, as the very fine pith rays; outer summer wood with a tinge of red; heartwood light reddish brown ..... (Nos. 71-75) HICKORY.
  2. Fine concentric lines, much finer than the pith rays; no reddish tinge in summer wood; sapwood white; heartwood blackish, ..... (No. 105) PERSIMMON.

## ADDITIONAL NOTES FOR DISTINCTIONS IN THE GROUP.

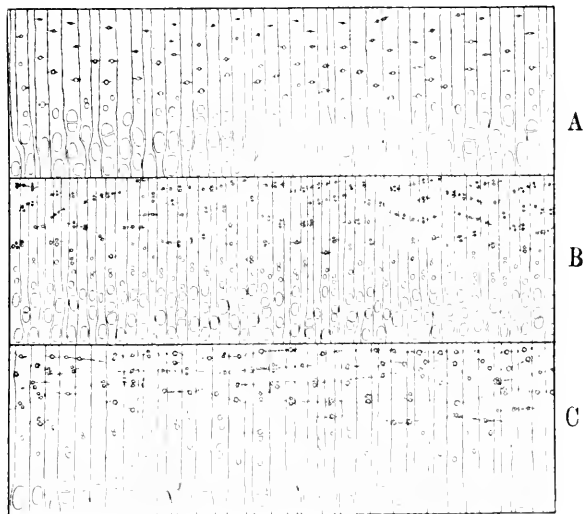


FIG. 41.—A, black ash; B, white ash; C, green ash.

The different species of ash may be identified as follows:

1. Pores in the summer wood more or less united into lines.
  - a. The lines short and broken, occurring mostly near the limit of the ring ..... (No. 39) WHITE ASH.
  - b. The lines quite long and conspicuous in most parts of the summer wood ..... (No. 13) GREEN ASH.
2. Pores in the summer wood not united into lines, or rarely so.
  - a. Heartwood reddish brown and very firm ..... (No. 10) RED ASH.
  - b. Heartwood grayish brown, and much more porous. (No. 41) BLACK ASH.

## ADDITIONAL NOTES—continued.

In the oaks, two groups can be readily distinguished by the manner in which the pores are distributed in the summer wood. In the white oaks the pores are very fine and numerous and crowded in the outer part of the summer wood, while in the black or red oaks the pores are larger, few in number, and mostly isolated. The live oaks, as far as structure is concerned, belong to the black oaks, but are much less porous, and are exceedingly heavy and hard.

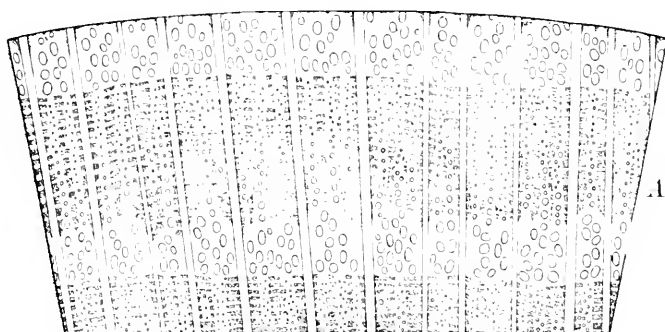


FIG. 42.—Wood of red oak. (For white oak see fig. 38.)

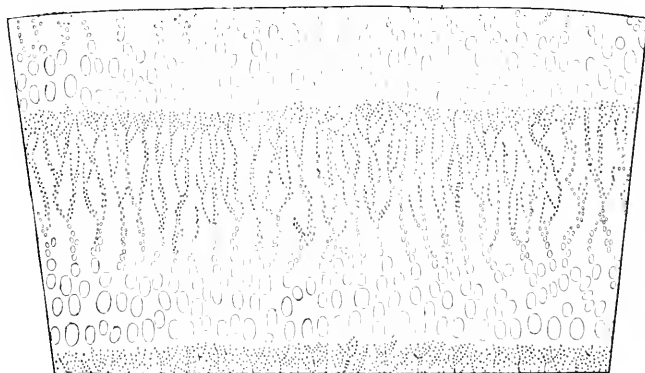


FIG. 43.—Wood of chestnut.

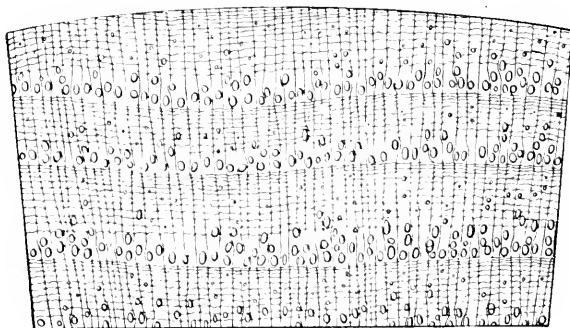


FIG. 44.—Wood of hickory.

## III.—DIFFUSE-POROUS WOODS.

[A few indistinctly ring-porous woods of Group II. D. and cedar elm may seem to belong here.]

- A. Pores varying in size from large to minute; largest in spring wood, thereby giving sometimes the appearance of a ring-porous arrangement.
1. Heavy and hard; color of heartwood (especially on longitudinal section) chocolate brown ..... (No. 116) BLACK WALNUT.
  2. Light and soft; color of heartwood light reddish brown. (No. 55) BETTERNUT.
- B. Pores all minute and indistinct; most numerous in spring wood, giving rise to a lighter colored zone or line (especially on longitudinal section), thereby appearing sometimes ring porous; wood hard, heartwood viscous reddish; pith rays very fine, but very distinct. (See also the sometimes indistinct ring-porous cedar elm, and occasionally winged elm, which are readily distinguished by the concentric wavy lines of pores in the summer wood) ..... (No. 57) CHERRY.
- C. Pores minute or indistinct, neither conspicuously larger nor more numerous in the spring wood and evenly distributed.
1. Broad pith rays present.
    - a. All or most pith rays broad, numerous, and crowded, especially on tangential sections, medium heavy and hard, difficult to split.  
(Nos. 112 and 113) SYCAMORE.
    - b. Only part of the pith rays broad.
      - a'. Broad pith rays well defined, quite numerous; wood reddish-white to reddish. .... (No. 47) BEECH.
      - b'. Broad pith rays not sharply defined, made up of many small rays, not numerous. Stem furrowed, and therefore the periphery of section, and with it the annual rings sinuous, bending in and out, and the large pith rays generally limited to the furrows or concave portions. Wood white, not reddish. .... (No. 52) BLUE BEECH.
  2. No broad pith rays present.
    - a. Pith rays small to very small, but quite distinct.
      - a'. Wood hard.
        - a''. Color reddish white, with dark reddish tinge in outer summer wood ..... (Nos. 79-82) MAPLE.
        - b''. Color white, without reddish tinge ..... (No. 76) HOLLY.
      - b'. Wood soft to very soft.
        - a''. Pores crowded, occupying nearly all the space between pith rays.
          - a . Color yellowish white, often a with greenish tinge in heartwood ..... (No. 115) TULIP POPLAR,
          - (No. 116) CUCUMBER TREE,
          - b . Color of sapwood grayish, of heartwood light to dark reddish brown. .... (No. 69) SWEET GUM.
        - b''. Pores not crowded, occupying not over one-third the space between pith rays; heartwood brownish white to very light brown,  
(Nos. 15 and 46) BASSWOOD.
    - b. Pith rays scarcely distinct, yet if viewed with ordinary magnifier, plainly visible.
      - a'. Pores indistinct to the naked eye.
        - a . Color uniform pale yellow; pith rays not conspicuous even on the radial section ..... (Nos. 53 and 54) BUCKEYE.
        - b . Sapwood yellowish gray, heartwood grayish brown; pith rays conspicuous on the radial section ..... (Nos. 67-68) SOUR GUM.
      - b'. Pores scarcely distinct, but mostly visible as grayish specks on the cross section; sapwood whitish, heartwood reddish. .... (Nos. 48-51) BIRCH.
- D. Pith rays not visible or else indistinct, even if viewed with magnifier.
1. Wood very soft, white, or in shades of brown, usually with a silky luster,  
(Nos. 105-110) COTTONWOOD (POPLAR.)

## ADDITIONAL NOTES FOR DISTINCTIONS IN THE GROUP.

Cherry and birch are sometimes confounded, the high pith rays on the cherry on radial sections readily distinguishes it; distinct pores on birch and spring wood zone in cherry as well as the darker vinous brown color of the latter will prove helpful.

Two groups of birches can be readily distinguished, though specific distinction is not always possible.

1. Pith rays fairly distinct, the pores rather few and not more abundant in the spring wood; wood heavy, usually darker.

(No. 18) CHERRY BIRCH and (No. 49) YELLOW BIRCH.

2. Pith rays barely distinct, pores more numerous and commonly forming a more porous spring-wood zone; wood of medium weight.

(No. 51) CANOE OR PAPER BIRCH.

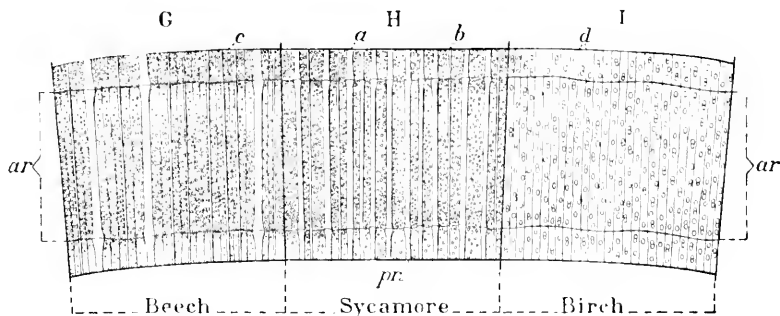


FIG. 45.—Wood of beech, sycamore, and birch.

The species of maple may be distinguished as follows:

1. Most of the pith rays broader than the pores and very conspicuous.  
(No. 79) SUGAR MAPLE.
2. Pith rays not or rarely broader than the pores, fine but conspicuous.
  - a. Wood heavy and hard, usually of darker reddish color and commonly spotted on cross section..... (No. 80) RED MAPLE.
  - b. Wood of medium weight and hardness, usually light colored,  
(No. 82) SILVER MAPLE.

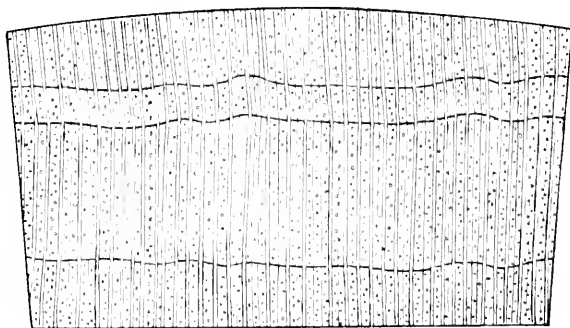


FIG. 46.—Wood of maple.

Red maple is not always safely distinguished from soft maple. In box elder the pores are finer and more numerous than in soft maple.

## ADDITIONAL NOTES—continued.

The various species of elm may be distinguished as follows:

1. Pores of spring wood form a broad band of several rows; easy splitting, dark brown heart ..... (No. 61) RED ELM.
2. Pores of spring wood usually in a single row, or nearly so.
  - a.* Pores of spring wood large, conspicuously so ..... (No. 62) WHITE ELM.
  - b.* Pores of spring wood small to minute.
    - a'.* Lines of pores in summer wood line, not as wide as the intermediate spaces, giving rise to very compact grain. .... (No. 63) ROCK ELM.
    - b.* Lines of pores broad, commonly as wide as the intermediate spaces, ..... (No. 65) WINGED ELM.
- c.* Pores in spring wood indistinct, and therefore hardly a ring-porous wood ..... (No. 65) CEDAR ELM.

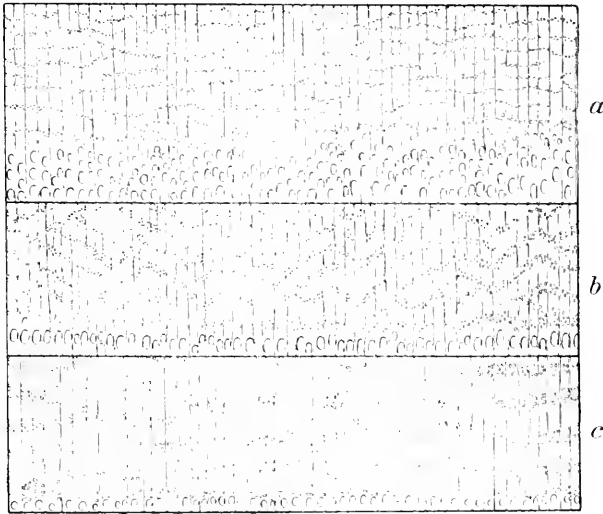


FIG. 47.—Wood of elm: *a*, red elm; *b*, white elm; *c*, winged elm.

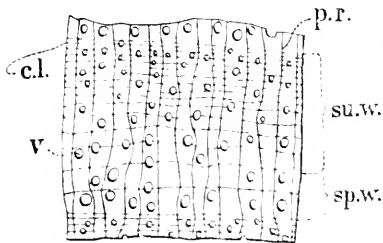


FIG. 48.—Walnut. *p. r.*, pith rays; *c. l.*, concentric lines; *v.*, vessels or pores; *su. w.*, summer wood; *sp. w.*, spring wood.

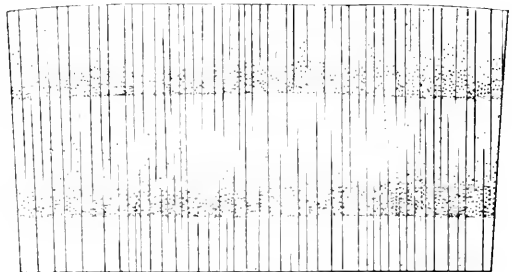


FIG. 49.—Wood of cherry.

# LIST OF THE MORE IMPORTANT WOODS OF THE UNITED STATES.

[Arranged alphabetically.]

## A.—CONIFEROUS WOODS.

Woods of simple and uniform structure, generally light, soft but stiff; abundant in suitable dimensions and forming by far the greatest part of all the lumber used.

**CEDAR.**—Light, soft, stiff, not strong, of fine texture; sap and heartwood distinct, the former lighter, the latter a dull, grayish brown, or red. The wood seasons rapidly, shrinks and checks but little, and is very durable. Used like soft pine, but owing to its great durability preferred for shingles, etc. Small sizes used for posts, ties, etc.<sup>1</sup> Cedars usually occur scattered, but they form, in certain localities, forests of considerable extent.

a. **White cedars.**—Heartwood a light grayish brown.

1. **WHITE CEDAR** (*Thuja occidentalis*) (Arborvite): Scattered along streams and lakes, frequently covering extensive swamps; rarely large enough for lumber, but commonly used for posts, ties, etc. Maine to Minnesota and northward.
2. **CANOE CEDAR** (*Thuja gigantea*) (red cedar of the West): In Oregon and Washington a very large tree, covering extensive swamps; in the mountains much smaller, skirting the water courses; an important lumber tree. Washington to northern California and eastward to Montana.
3. **WHITE CEDAR** (*Chamaecyparis thyoides*): Medium-sized tree, wood very light and soft. Along the coast from Maine to Mississippi.
4. **WHITE CEDAR** (*Chamaecyparis lawsoniana*) (Port Orford cedar, Oregon cedar, Lawson's cypress, ginger pine): A very large tree, extensively cut for lumber; heavier and stronger than the preceding. Along the coast line of Oregon.
5. **WHITE CEDAR** (*Libocedrus decurrens*) (incense cedar): A large tree, abundantly scattered among pine and fir; wood fine grained. Cascades and Sierra Nevada of Oregon and California.

b. **Red cedars.**—Heartwood red.

6. **RED CEDAR** (*Juniperus virginiana*) (Savin juniper): Similar to white cedar, but of somewhat finer texture. Used in cabinetwork in cooperage, for veneers, and especially for lead pencils, for which purpose alone several million feet are cut each year. A small to medium sized tree scattered through the forests, or, in the West, sparsely covering extensive areas (cedar brakes). The red cedar is the most widely distributed conifer of the United States, occurring from the Atlantic to the Pacific and from Florida to Minnesota, but attains a suitable size for lumber only in the Southern, and more especially the Gulf, States.
7. **REDWOOD** (*Sequoia sempervirens*): Wood in its quality and uses like white cedar; the narrow sapwood whitish; the heartwood light red, soon turning to brownish red when exposed. A very large tree, limited to the coast ranges of California, and forming considerable forests, which are rapidly being converted into lumber.

## CYPRESS.

8. **CYPRESS** (*Taxodium distichum*) (bald cypress; black, white, and red cypress): Wood in appearance, quality, and uses similar to white cedar. "Black

<sup>1</sup>Since almost all kinds of woods are used for fuel and charcoal, and in the construction of fences, sheds, barns, etc., the enumeration of these uses has been omitted in this list.



cypress" and "white cypress" are heavy and light forms of the same species. The cypress is a large deciduous tree, occupying much of the swamp and overflow land along the coast and rivers of the Southern States.

**FIR.**—This name is frequently applied to wood and to trees which are not fir; most commonly to spruce, but also, especially in English markets, to pine. It resembles spruce, but is easily distinguished from it, as well as from pine and larch, by the absence of resin ducts. Quality, uses, and habits similar to spruce.

9. **BALSAM FIR** (*Abies balsamea*): A medium-sized tree scattered throughout the northern pineries; cut, in lumber operations whenever of sufficient size, and sold with pine or spruce. Minnesota to Maine and northward.

10. **WHITE FIR** (*Abies grandis* and *Abies concolor*): Medium to very large sized tree, forming an important part of most of the Western mountain forests, and furnishing much of the lumber of the respective regions. The former occurs from Vancouver to central California and eastward to Montana; the latter from Oregon to Arizona and eastward to Colorado and New Mexico.

11. **WHITE FIR** (*Abies amabilis*): Good sized tree, often forming extensive mountain forests. Cascade Mountains of Washington and Oregon.

12. **RED FIR** (*Abies nobilis*) (not to be confounded with Douglas fir; see No. 37): Large to very large tree, forming with *A. amabilis* extensive forests on the slope of the mountains between 3,000 and 4,000 feet elevation. Cascade Mountains of Oregon.

13. **RED FIR** (*Abies magnifica*): Very large tree, forming forests about the base of Mount Shasta. Sierra Nevada of California, from Mount Shasta southward.

**HEMLOCK.**—Light to medium weight, soft, stiff but brittle, commonly crossgrained, rough and splintery; sapwood and heartwood not well defined; the wood of a light, reddish-gray color, free from resin ducts, moderately durable, shrinks and warps considerably, wears rough, retains nails firmly. Used principally for dimension stuff and timbers. Hemlocks are medium to large sized trees, commonly scattered among broad-leaved trees and conifers, but often forming forests of almost pure growth.

14. **HEMLOCK** (*Tsuga canadensis*): Medium-sized tree, furnishes almost all the hemlock of the Eastern market. Maine to Wisconsin; also following the Alleghanies southward to Georgia and Alabama.

15. **HEMLOCK** (*Tsuga mertensiana*): Large-sized tree, wood claimed to be heavier and harder than the Eastern form and of superior quality. Washington to California and eastward to Montana.

**LARCH OR TAMARACK.**—Wood like the best of hard pine, both in appearance, quality, and uses, and owing to its great durability, somewhat preferred in ship-building, for telegraph poles, and railroad ties. In its structure it resembles spruce. The larches are deciduous trees, occasionally covering considerable areas, but usually scattered among other conifers.

16. **TAMARACK** (*Larix americana*) (Hackmatack): Medium-sized tree, often covering swamps, in which case it is smaller and of poor quality. Maine to Minnesota, and southward to Pennsylvania.

17. **TAMARACK** (*L. occidentalis*): Large-sized trees, scattered, locally abundant. Washington and Oregon to Montana.

**PINE.**—Very variable, very light and soft in "soft" pine, such as white pine; of medium weight to heavy and quite hard in "hard" pine, of which longleaf or Georgia pine is the extreme form. Usually it is stiff, quite strong, of even texture, and more or less resinous. The sapwood is yellowish white; the heartwood, orange brown. Pine shrinks moderately, seasons rapidly and without much injury; it works easily; is never too hard to nail (unlike oak or hickory); it is mostly quite durable, and if well seasoned is not subject to the attacks of boring insects. The heavier the wood, the darker, stronger, and harder it is, and the more it shrinks and checks. Pine is used more extensively than any other kind of wood. It is

the principal wood in common carpentry, as well as in all heavy construction, bridges, trestles, etc. It is also used in almost every other wood industry, for spars, masts, planks, and timbers in shipbuilding, in car and wagon construction, in cooperage, for crates and boxes, in furniture work, for toys and patterns, railway ties, water pipes, excelsior, etc. Pines are usually large trees with few branches, the straight, cylindrical, useful stem forming by far the greatest part of the tree; they occur gregariously, forming vast forests, a fact which greatly facilitates their exploitation. Of the many special terms applied to pine as lumber, denoting sometimes differences in quality, the following deserve attention:

"White pine," "pumpkin pine," "soft pine," in the Eastern markets refer to the wood of the white pine (*Pinus strobus*), and on the Pacific Coast to that of the sugar pine (*Pinus lambertiana*).

"Yellow pine" is applied in the trade to all the Southern lumber pines; in the Northeast it is also applied to the pitch pine (*P. rigida*); in the West it refers mostly to bull pine (*P. ponderosa*).

"Yellow longleaf pine," "Georgia pine," chiefly used in advertisement, refers to longleaf pine (*P. palustris*).

"Hard pine" is a common term in carpentry, and applies to everything except white pine.

"Pitch pine" includes all Southern pines and also the true pitch pine (*P. rigida*), but is mostly applied, especially in foreign markets, to the wood of the longleaf pine (*P. palustris*).

For the great variety of confusing local names applied to the Southern pines in their homes, part of which have been adopted in the markets of the Atlantic seaboard, see report of Chief of Division of Forestry for 1891, page 212, etc., and also the list below:

#### a. Soft pines.

18. WHITE PINE (*Pinus strobus*): Large to very large sized tree; for the last fifty years the most important timber tree of the Union, furnishing the best quality of soft pine. Minnesota, Wisconsin, Michigan, New England, along the Alleghanies to Georgia.
19. SUGAR PINE (*Pinus lambertiana*): A very large tree, together with *Abies concolor*, forming extensive forests; important lumber tree. Oregon and California.
20. WHITE PINE (*Pinus monticola*): A large tree, at home in Montana, Idaho, and the Pacific States; most common and locally used in northern Idaho.
21. WHITE PINE (*Pinus flexilis*): A small tree, forming mountain forests of considerable extent and locally used; Eastern Rocky Mountain slopes; Montana to New Mexico.

#### b. Hard pines.

22. LONGLEAF PINE (*Pinus palustris*) (Georgia pine, yellow pine, long straw pine, etc.): Large tree; forms extensive forests and furnishes the hardest and strongest pine lumber in the market. Coast region from North Carolina to Texas.
23. BULL PINE (*Pinus ponderosa*) (yellow pine): Medium to very large sized tree, forming extensive forests in Pacific and Rocky Mountain regions; furnishes most of the hard pine of the West; sapwood wide; wood very variable.
24. LOBLOLLY PINE (*Pinus taeda*) (slash pine, old field pine, rosemary pine, sap pine, short straw pine, etc.): Large-sized tree, forms extensive forests; wider-ringed, coarser, lighter, softer, with more sapwood than the longleaf pine, but the two often confounded. This is the common lumber pine from Virginia to South Carolina, and is found extensively in Arkansas and Texas. Southern States; Virginia to Texas and Arkansas.
25. NORWAY PINE (*Pinus resinosa*): Large-sized tree, never forming forests, usually scattered or in small groves, together with white pine; largely sapwood and hence not durable. Minnesota to Michigan; also in New England to Pennsylvania.

26. **SHORTLEAF PINE** (*Pinus echinata*) (slash pine, Carolina pine, yellow pine, old field pine, etc.): Resembles loblolly pine; often approaches in its wood the Norway pine. The common lumber pine of Missouri and Arkansas. North Carolina to Texas and Missouri.

27. **CUBAN PINE** (*Pinus cubensis*) (slash pine, swamp pine, bastard pine, meadow pine): Resembles longleaf pine, but commonly has wider sapwood and coarser grain; does not enter the markets to any great extent. Along the coast from South Carolina to Louisiana.

28. **BULL PINE** (*Pinus jeffreyi*) (black pine): Large-sized tree, wood resembling bull pine (*P. ponderosa*); used locally in California, replacing *P. ponderosa* at high altitudes.

The following are small to medium sized pines, not commonly offered as lumber in the market; used locally for timber, ties, etc.:

29. **BLACK PINE** (*Pinus murrayana*) (lodge-pole pine, tamarack): Rocky Mountains and Pacific regions.

30. **PITCH PINE** (*Pinus rigida*): Along the coast from New York to Georgia and along the mountains to Kentucky.

31. **JERSEY PINE** (*Pinus inops*) (scrub pine): As before.

32. **GRAY PINE** (*Pinus banksiana*) (scrub pine): Maine, Vermont, and Michigan to Minnesota.

#### **REDWOOD.** (See CEDAR.)

**SPRUCE.**—Resembles soft pine, is light, very soft, stiff, moderately strong, less resinous than pine; has no distinct heartwood, and is of whitish color. Used like soft pine, but also employed as resonance wood and preferred for paper pulp. Spruces, like pines, form extensive forests; they are more frugal, thrive on thinner soils, and bear more shade, but usually require a more humid climate. "Black" and "white spruce," as applied by lumbermen, usually refer to narrow and wide ringed forms of the black spruce (*Picea nigra*).

33. **BLACK SPRUCE** (*Picea nigra*): Medium-sized tree, forms extensive forests in northeastern United States and in British America; occurs scattered or in groves, especially in low lands throughout the Northern pineries. Important lumber tree in Eastern United States. Maine to Minnesota, British America, and on the Alleghenies to North Carolina.

34. **WHITE SPRUCE** (*Picea alba*): Generally associated with the preceding; most abundant along streams and lakes, grows largest in Montana and forms the most important tree of the subarctic forest of British America. Northern United States, from Maine to Minnesota, also from Montana to Pacific, British America.

35. **WHITE SPRUCE** (*Picea engelmanni*): Medium to large sized tree, forming extensive forests at elevations from 5,000 to 10,000 feet above sea level; resembles the preceding, but occupies a different station. A very important timber tree in the central and southern parts of the Rocky Mountains. Rocky Mountains from Mexico to Montana.

36. **TIDE-LAND SPRUCE** (*Picea sitchensis*): A large-sized tree, forming an extensive coast-belt forest. Along the seacoast from Alaska to Central California.

**BASTARD SPRUCE.**—Spruce or fir in name but resembling hard pine or larch in the appearance, quality, and uses of its wood.

37. **DOUGLAS SPRUCE** (*Pseudotsuga douglasii*) (yellow fir, red fir, Oregon pine): One of the most important trees of the Western United States; grows very large in the Pacific States, to fair size in all parts of the mountains, in Colorado up to about 10,000 feet above sea level; forms extensive forests, often of pure growth. Wood very variable, usually coarse-grained and heavy, with very pronounced summer wood, hard and strong ("red" fir), but often fine-grained and light ("yellow" fir). It replaces hard pine and is especially suited to heavy construction. From the plains to the Pacific Ocean; from Mexico to British America.

**TAMARACK.** (*See* LARCH.)

**YEW.**—Wood heavy, hard, extremely stiff and strong, of fine texture with a pale yellow sapwood, and an orange red heart; seasons well and is quite durable. Yew is extensively used for archery, bows, turner's ware, etc. The yews form no forests, but occur scattered with other conifers.

38. **YEW** (*Taxus brevifolia*): A small to medium sized tree of the Pacific region.

**B.—BROAD-LEAVED WOODS (HARDWOODS).**

Woods of complex and very variable structure and therefore differing widely in quality, behavior, and consequently in applicability to the arts.

**ASH.**—Wood heavy, hard, strong, stiff, quite tough, not durable in contact with soil, straight grained, rough on the split surface and coarse in texture. The wood shrinks moderately, seasons with little injury, stands well and takes a good polish. In carpentry ash is used for finishing lumber, stairways, panels, etc.; it is used in shipbuilding, in the construction of cars, wagons, carriages, etc., in the manufacture of farm implements, machinery, and especially of furniture of all kinds, and also for harness work; for barrels, baskets, oars, tool handles, hoops, clothespins, and toys. The trees of the several species of ash are rapid growers, of small to medium height with stout trunks; they form no forests, but occur scattered in almost all our broad-leaved forests.

39. **WHITE ASH** (*Fraxinus americana*): Medium, sometimes large sized tree. Basin of the Ohio, but found from Maine to Minnesota and Texas.

40. **RED ASH** (*Fraxinus pubescens*): Small-sized tree. North Atlantic States, but extends to the Mississippi.

41. **BLACK ASH** (*Fraxinus sambucifolia*) (hoop ash, ground ash): Medium-sized tree, very common. Maine to Minnesota, and southward to Virginia and Arkansas.

42. **BLUE ASH** (*Fraxinus quadrangulata*): Small to medium sized. Indiana and Illinois; occurs from Michigan to Minnesota and southward to Alabama.

43. **GREEN ASH** (*Fraxinus viridis*): Small-sized tree. New York to the Rocky Mountains, and southward to Florida and Arizona.

44. **OREGON ASH** (*Fraxinus oregana*): Medium-sized tree. Western Washington to California.

**ASPEN.** (*See* POPLAR.)**BASSWOOD.**

45. **BASSWOOD** (*Tilia americana*) (lime tree, American linden, lin, bee tree): Wood light, soft, stiff but not strong, of fine texture, and white to light brown color. The wood shrinks considerably in drying, works and stands well; it is used in carpentry, in the manufacture of furniture and woodenware, both turned and carved, in cooperage, for toys, also for paneling of car and carriage bodies. Medium to large sized tree, common in all Northern broad-leaved forests; found throughout the Eastern United States.

46. **WHITE BASSWOOD** (*Tilia heterophylla*): A small-sized tree most abundant in the Alleghany region.

**BEECH.**

47. **BEECH** (*Fagus ferruginea*): Wood heavy, hard, stiff, strong, of rather coarse texture, white to light brown, not durable in the ground, and subject to the inroads of boring insects; it shrinks and checks considerably in drying, works and stands well and takes a good polish. Used for furniture, in turnery, for handles, lasts, etc. Abroad it is very extensively employed by the carpenter, millwright, and wagon maker, in turnery as well as wood carving. The beech is a medium-sized tree, common, sometimes forming forest; most abundant in the Ohio and Mississippi basin, but found from Maine to Wisconsin and southward to Florida.

**BIRCH.**—Wood heavy, hard, strong, of fine texture; sapwood whitish, heartwood in shades of brown with red and yellow; very handsome, with satiny luster, equaling cherry. The wood shrinks considerably in drying, works and stands

well and takes a good polish, but is not durable, if exposed. Birch is used for finishing lumber in building, in the manufacture of furniture, in wood turnery for spools, boxes, wooden shoes, etc., for shoe lasts and pegs, for wagon hubs, ox yokes, etc., also in wood carving. The birches are medium-sized trees, form extensive forests northward and occur scattered in all broad-leaved forests of the Eastern United States.

48. CHERRY BIRCH (*Betula lenta*) (black birch, sweet birch, mahogany birch): Medium-sized tree; very common. Maine to Michigan and to Tennessee.

49. YELLOW BIRCH (*Betula lutea*) (gray birch): Medium-sized tree; common. Maine to Minnesota and southward to Tennessee.

50. RED BIRCH (*Betula nigra*) (river birch): Small to medium sized tree; very common; lighter and less valuable than the preceding. New England to Texas and Missouri.

51. CANOE BIRCH (*Betula papyrifera*) (white birch, paper birch): Generally a small tree; common, forming forests; wood of good quality but lighter. All along the northern boundary of United States and northward, from the Atlantic to the Pacific.

**BLACK WALNUT.** (See WALNUT.)

**BLUE BEECH.**

52. BLUE BEECH (*Carpinus caroliniana*) (hornbeam, water beech, ironwood): Wood very heavy, hard, strong, very stiff, of rather fine texture and white color; not durable in the ground; shrinks and checks greatly, but works and stands well. Used chiefly in turnery for tool handles, etc. Abroad, much used by mill and wheel wrights. A small tree, largest in the Southwest, but found in nearly all parts of the Eastern United States.

**BOIS D'ARC.** (See OSAGE ORANGE.)

**BUCKEYE—HORSE CHESTNUT.**—Wood light, soft, not strong, often quite tough, of fine and uniform texture and creamy white color. It shrinks considerably, but works and stands well. Used for wooden ware, artificial limbs, paper pulp, and locally also for building lumber. Small-sized trees, scattered.

53. OHIO BUCKEYE (*Esculus glabra*) (fetid buckeye): Alleghanies, Pennsylvania to Indian Territory.

54. SWEET BUCKEYE (*Esculus flava*): Alleghanies, Pennsylvania to Texas.

**BUTTERNUT.**

55. BUTTERNUT (*Juglans cinerea*) (white walnut): Wood very similar to black walnut, but light, quite soft, not strong and of light brown color. Used chiefly for finishing lumber, cabinetwork, and cooperage. Medium-sized tree, largest and most common in the Ohio basin; Maine to Minnesota and southward to Georgia and Alabama.

**CATALPA.**

56. CATALPA (*Catalpa speciosa*): Wood light, soft, not strong, brittle, durable, of coarse texture and brown color; used for ties and posts, but well suited for a great variety of uses. Medium-sized tree; lower basin of the Ohio River, locally common. Extensively planted, and therefore promising to become of some importance.

**CHERRY.**

57. CHERRY (*Prunus serotina*): Wood heavy, hard, strong, of fine texture; sap wood yellowish white, heartwood reddish to brown. The wood shrinks considerably in drying, works and stands well, takes a good polish, and is much esteemed for its beauty. Cherry is chiefly used as a decorative finishing lumber for buildings, cars, and boats, also for furniture and in turnery. It is becoming too costly for many purposes for which it is naturally well suited. The lumber-furnishing cherry of this country, the wild black cherry (*Prunus serotina*), is a small to medium sized tree, scattered through many of the broad-leaved woods of the western slope of the Alleghanies, but found from Michigan to Florida and west to Texas. Other species of this genus as well

as the hawthorns (*Crataegus*) and wild apple (*Pyrus*) are not commonly offered in the market. Their wood is of the same character as cherry, often even finer, but in small dimensions.

### CHESTNUT.

58. CHESTNUT (*Castanea vulgaris* var. *americana*): Wood light, moderately soft, stiff, not strong, of coarse texture; the sapwood light, the heartwood darker brown. It shrinks and checks considerably in drying, works easily, stands well, and is very durable. Used in cabinetwork, cooperage, for railway ties, telegraph poles, and locally in heavy construction. Medium-sized tree, very common in the Alleghanies, occurs from Maine to Michigan and southward to Alabama.

59. CHINQUAPIN (*Castanea pumila*): A small-sized tree, with wood slightly heavier but otherwise similar to the preceding; most common in Arkansas, but with nearly the same range as the chestnut.

60. CHINQUAPIN (*Castanopsis chrysophylla*): A medium-sized tree of the western ranges of California and Oregon.

### COFFEE TREE.

61. COFFEE TREE (*Gymnocladus canadensis*) (coffee nut): Wood heavy, hard, strong, very stiff, of coarse texture, durable; the sapwood yellow, the heartwood reddish brown; shrinks and checks considerably in drying; works and stands well and takes a good polish. It is used to a limited extent in cabinetwork. A medium to large sized tree; not common. Pennsylvania to Minnesota and Arkansas.

### COTTONWOOD. (See POPLAR.)

### CUCUMBER TREE. (See TULIP.)

**ELM.**—Wood heavy, hard, strong, very tough; moderately durable in contact with the soil; commonly crossgrained, difficult to split and shape, warps, and checks considerably in drying, but stands well if properly handled. The broad sapwood whitish, heart brown, both with shades of gray and red; on split surface rough; texture coarse to fine; capable of high polish. Elm is used in the construction of cars, wagons, etc., in boat and ship building, for agricultural implements and machinery; in rough cooperage, saddlery and harness work, but particularly in the manufacture of all kinds of furniture, where the beautiful figures, especially those of the tangential or bastard section, are just beginning to be duly appreciated. The elms are medium to large sized trees, of fairly rapid growth, with stout trunk, form no forests of pure growth, but are found scattered in all the broad-leaved woods of our country, sometimes forming a considerable portion of the arborescent growth.

62. WHITE ELM (*Ulmus americana*) (American elm, water elm): Medium to large sized tree, common. Maine to Minnesota, southward to Florida and Texas.

63. ROCK ELM (*Ulmus racemosa*) (cork elm, hickory elm, white elm, cliff elm): Medium to large sized tree. Michigan, Ohio, from Vermont to Iowa, southward to Kentucky.

64. RED ELM (*Ulmus fulva*) (slippery elm, moose elm): Small-sized tree, found chiefly along water courses. New York to Minnesota, and southward to Florida and Texas.

65. CEDAR ELM (*Ulmus crassifolia*): Small-sized tree, quite common. Arkansas and Texas.

66. WINGED ELM (*Ulmus alata*) (Wahoo): Small-sized tree, locally quite common. Arkansas, Missouri, and eastern Virginia.

**GUM.**—This general term refers to two kinds of wood usually distinguished as sweet or red gum, and sour, black, or tupelo gum, the former being a relative of the witch-hazel, the latter belonging to the dogwood family.

67. TUPELO (*Nyssa sylvatica*) (sour gum, black gum): Maine to Michigan, and southward to Florida and Texas. Wood heavy, hard, strong, tough, of fine texture,

frequently crossgrained, of yellowish or grayish white color, hard to split and work, troublesome in seasoning, warps and checks considerably, and is not durable if exposed; used for wagon hubs, wooden ware, handles, wooden shoes, etc. Medium to large sized trees, with straight, clear trunks; locally quite abundant, but never forming forests of pure growth.

58. TUPELO GUM (*Nyssa uniflora*) (cotton gum): Lower Mississippi basin, northward to Illinois and eastward to Virginia, otherwise like preceding species.

69. SWEET GUM (*Liquidambar styraciflua*) (red gum, liquidambar, bilsted): Wood, rather heavy, rather soft, quite stiff and strong, tough, commonly crossgrained, of fine texture; the broad sapwood whitish, the heartwood reddish brown; the wood shrinks and warps considerably, but does not check badly, stands well when fully seasoned, and takes good polish. Sweet gum is used in carpentry, in the manufacture of furniture, for cut veneer, for wooden plates, plaques, baskets, etc., also for wagon hubs, hat blocks, etc. A large-sized tree, very abundant, often the principal tree in the swampy parts of the bottoms of the Lower Mississippi Valley; occurs from New York to Texas and from Indiana to Florida.

#### **HACKBERRY.**

70. HACKBERRY (*Celtis occidentalis*) (sugar berry): The handsome wood heavy, hard, strong, quite tough, of moderately fine texture, and greenish or yellowish white color; shrinks moderately, works well, and takes a good polish. So far but little used in the manufacture of furniture. Medium to large sized tree, locally quite common, largest in the Lower Mississippi Valley; occurs in nearly all parts of the Eastern United States.

**HICKORY.**—Wood very heavy, hard, and strong, proverbially tough, of rather coarse texture, smooth and of straight grain. The broad sapwood white, the heart reddish nut brown. It dries slowly, shrinks and checks considerably; is not durable in the ground, or if exposed, and, especially the sapwood, is always subject to the inroads of boring insects. Hickory excels as carriage and wagon stock, but is also extensively used in the manufacture of implements and machinery, for tool handles, timber pins, for harness work, and cooperage. The hickories are tall trees with slender stems, never form forests, occasionally small groves, but usually occur scattered among other broad-leaved trees in suitable localities. The following species all contribute more or less to the hickory of the markets:

71. SHAGBARK HICKORY (*Hicoria ovata*) (shellbark hickory): A medium to large sized tree, quite common; the favorite among hickories; best developed in the Ohio and Mississippi basins; from Lake Ontario to Texas, Minnesota to Florida.

72. MOCKERNUT HICKORY (*Hicoria alba*) (black hickory, bull and black nut, big bud, and white-heart hickory): A medium to large sized tree, with the same range as the foregoing; common, especially in the South.

73. PIGNUT HICKORY (*Hicoria glabra*) (brown hickory, black hickory, switch-bud hickory): Medium to large sized tree, abundant; all Eastern United States.

74. BITTER NUT HICKORY (*Hicoria minima*) (swamp hickory): A medium-sized tree, favoring wet localities, with the same range as the preceding.

75. PECAN (*Hicoria pecan*) (Illinois nut): A large tree, very common in the fertile bottoms of the Western streams. Indiana to Nebraska and southward to Louisiana and Texas.

#### **HOLLY.**

76. HOLLY (*Ilex opaca*): Wood of medium weight, hard, strong, tough, of fine texture and white color; works and stands well, used for cabinetwork and turnery. A small tree, most abundant in the Lower Mississippi Valley and Gulf States, but occurring eastward to Massachusetts and north to Indiana.

**HORSE-CHESTNUT.** (See BUCKEYE.)

**IRONWOOD.** (See BLUE BEECH.)

**LOCUST.**—This name applies to both of the following:

77. **BLACK LOCUST** (*Robinia pseudacacia*) (black locust, yellow locust): Wood very heavy, hard, strong, and tough, of coarse texture, very durable in contact with the soil, shrinks considerably and swells in seasoning; the very narrow sapwood yellowish, the heartwood brown, with shades of red and green. Used for wagon hubs, tree nails or pins, but especially for ties, posts, etc. Abroad it is much used for furniture and farm implements and also in turnery. Small to medium sized tree, at home in the Alleghamies, extensively planted, especially in the West.

78. **HONEY LOCUST** (*Gleditsia triacanthos*) (black locust, sweet locust, three-thorned acacia): Wood heavy, hard, strong, tough, of coarse texture, susceptible of a good polish, the narrow sapwood yellow, the heartwood brownish red. So far, but little appreciated except for fencing and fuel; used to some extent for wagon hubs and in rough construction. A medium-sized tree, found from Pennsylvania to Nebraska, and southward to Florida and Texas; locally quite abundant.

**MAGNOLIA.** (See TULIP.)

**MAPLE.**—Wood heavy, hard, strong, stiff, and tough, of fine texture, frequently wavy-grained, this giving rise to “curly” and “blister” figures; not durable in the ground or otherwise exposed. Maple is creamy white, with shades of light brown in the heart; shrinks moderately, seasons, works and stands well, wears smoothly, and takes a fine polish. The wood is used for ceiling, flooring, paneling, stairway, and other finishing lumber in house, ship, and car construction; it is used for the keels of boats and ships, in the manufacture of implements and machinery, but especially for furniture, where entire chamber sets of maple rival those of oak. Maple is also used for shoe lasts and other form blocks, for shoe pegs, for piano actions, school apparatus, for wood type in show bill printing, tool handles, in wood carving, turnery, and scroll work. The maples are medium-sized trees, of fairly rapid growth; sometimes form forests and frequently constitute a large proportion of the arborescent growth.

79. **SUGAR MAPLE** (*Acer saccharum*) (hard maple, rock maple): Medium to large sized tree, very common, forms considerable forests. Maine to Minnesota, abundant, with birch, in parts of the pineries; southward to northern Florida; most abundant in the region of the Great Lakes.

80. **RED MAPLE** (*Acer rubrum*) (swamp or water maple): Medium-sized tree. Like the preceding, but scattered along water courses and other moist localities.

81. **SILVER MAPLE** (*Acer saccharinum*) (soft maple, silver maple): Medium-sized, common; wood lighter, softer, inferior to hard maple, and usually offered in small quantities and held separate in the market. Valley of the Ohio, but occurs from Maine to Dakota and southward to Florida.

82. **BROAD-LEAFED MAPLE** (*Acer macrophyllum*): Medium-sized tree, forms considerable forests, and like the preceding has a lighter, softer, and less valuable wood. Pacific Coast.

**MULBERRY.**

83. **RED MULBERRY** (*Morus rubra*): Wood moderately heavy, hard, strong, rather tough, of coarse texture, durable; sapwood whitish, heart yellow to orange brown; shrinks and checks considerably in drying; works and stands well. Used in cooperage and locally in shipbuilding and in the manufacture of farm implements. A small-sized tree, common in the Ohio and Mississippi valleys, but widely distributed in the Eastern United States.

**OAK**—Wood very variable, usually very heavy and hard, very strong and tough, porous, and of coarse texture; the sapwood whitish, the heart “oak” brown to reddish brown. It shrinks and checks badly, giving trouble in seasoning, but stands well, is durable, and little subject to attacks of insects. Oak is used for many purposes: in shipbuilding, for heavy construction, in common carpentry,



in furniture, car, and wagon work, cooperage, turnery, and even in wood carving; also in the manufacture of all kinds of farm implements, wooden mill machinery, for piles and wharves, railway ties, etc. The oaks are medium to large sized trees, forming the predominant part of a large portion of our broad-leaved forests, so that these are generally "oak forests" though they always contain a considerable proportion of other kinds of trees. Three well-marked kinds, white, red, and live oak, are distinguished and kept separate in the market. Of the two principal kinds white oak is the stronger, tougher, less porous, and more durable. Red oak, is usually of coarser texture, more porous, often brittle, less durable, and even more troublesome in seasoning than white oak. In carpentry and furniture work, red oak brings about the same price at present as white oak. The red oaks everywhere accompany the white oaks, and, like the latter, are usually represented by several species in any given locality. Live oak, once largely employed in shipbuilding, possesses all the good qualities (except that of size) of white oak, even to a greater degree. It is one of the heaviest, hardest, and most durable building timbers of this country; in structure it resembles the red oaks, but is much less porous.

84. WHITE OAK (*Quercus alba*): Medium to large sized tree, common in the Eastern States, Ohio and Mississippi valleys; occurs throughout Eastern United States.
85. BUR OAK (*Quercus macrocarpa*) (mossy-cup oak, over-cup oak): Large-sized tree, locally abundant, common. Bottoms west of Mississippi; range farther west than preceding.
86. SWAMP WHITE OAK (*Quercus bicolor*): Large-sized tree, common. Most abundant in the Lake States, but with range as in white oak.
87. YELLOW OAK (*Quercus prinoides*) (chestnut oak, chinquapin oak): Medium-sized tree. Southern Alleghanies, eastward to Massachusetts.
88. BASKET OAK (*Quercus michauxii*) (cow oak): Large-sized tree, locally abundant; lower Mississippi and eastward to Delaware.
89. OVER-CUP OAK (*Quercus lyrata*) (swamp white oak, swamp post oak): Medium to large sized tree, rather restricted; ranges as in the preceding.
90. POST OAK (*Quercus obtusiloba*) (iron oak): Medium to large sized tree. Arkansas to Texas, eastward to New England and northward to Michigan.
91. WHITE OAK (*Quercus durandii*): Medium to small sized tree. Texas, eastward to Alabama.
92. WHITE OAK (*Quercus garryana*): Medium to large sized tree. Washington to California.
93. WHITE OAK (*Quercus lobata*): Medium to large-sized tree; largest oak on the Pacific Coast; California.
94. RED OAK (*Quercus rubra*) (black oak): Medium to large sized tree; common in all parts of its range. Maine to Minnesota, and southward to the Gulf.
95. BLACK OAK (*Quercus tinctoria*) (yellow oak): Medium to large sized tree; very common in the Southern States, but occurring north as far as Minnesota, and eastward to Maine.
96. SPANISH OAK (*Quercus falcata*) (red oak): Medium sized tree, common in the South Atlantic and Gulf region, but found from Texas to New York, and north to Missouri and Kentucky.
97. SCARLET OAK (*Quercus coccinea*): Medium to large sized tree; best developed in the lower basin of the Ohio, but found from Maine to Missouri, and from Minnesota to Florida.
98. PIN OAK (*Quercus palustris*) (swamp spanish oak, water oak): Medium to large sized tree, common along borders of streams and swamps. Arkansas to Wisconsin, and eastward to the Alleghanies.
99. WILLOW OAK (*Quercus phellos*) (peach oak): Small to medium sized tree. New York to Texas, and northward to Kentucky.

100. WATER OAK (*Quercus aquatica*) (duck oak, possum oak, punk oak): Medium to large sized tree, of extremely rapid growth. Eastern Gulf States, eastward to Delaware, and northward to Missouri and Kentucky.
101. LIVE OAK (*Quercus virens*): Small-sized tree, scattered along the coast from Virginia to Texas.
102. LIVE OAK (*Quercus chrysolepis*). (maul oak, Valparaiso oak): Medium-sized tree; California.

### OSAGE ORANGE.

103. OSAGE ORANGE (*Maclura aurantiaca*) (Bois d'Arc): Wood very heavy, exceedingly hard, strong, not tough, of moderately coarse texture, and very durable; sapwood yellow, heart brown on the end, yellow on longitudinal faces, soon turning grayish brown if exposed; it shrinks considerably in drying, but once dry it stands unusually well. Formerly much used for wheel stock in the dry regions of Texas; otherwise employed for posts, railway ties, etc. Seems too little appreciated; it is well suited for turned ware and especially for wood carving. A small-sized tree, of fairly rapid growth, scattered through the rich bottoms of Arkansas and Texas.

### PERSIMMON.

104. PERSIMMON (*Diospyros virginiana*): Wood very heavy and hard, strong and tough; resembles hickory, but is of finer texture; the broad sapwood cream color, the heart black; used in turnery for shuttles, plane stocks, shoe lasts, etc. Small to medium sized tree, common and best developed in the Lower Ohio Valley, but occurs from New York to Texas and Missouri.

**POPLAR AND COTTONWOOD** (*See also* TULIP WOOD).—Wood light, very soft, not strong, of fine texture and whitish, grayish to yellowish color, usually with a satiny luster. The wood shrinks moderately (some crossgrained forms warp excessively), but checks little; is easily worked, but is not durable. Used as building and furniture lumber, in cooperage for sugar and flour barrels, for crates and boxes (especially cracker boxes), for wooden ware and paper pulp.

105. COTTONWOOD (*Populus monilifera*): Large sized tree; forms considerable forests along many of the Western streams, and furnishes most of the cottonwood of the market. Mississippi Valley and west; New England to the Rocky Mountains.
106. BALSAM (*Populus balsamifera*) (balm of Gilead): Medium to large sized tree; common all along the northern boundary of the United States.
107. BLACK COTTONWOOD (*Populus trichocarpa*): The largest deciduous tree of Washington; very common. Northern Rocky Mountains and Pacific region.
108. COTTONWOOD (*Populus fremontii* var. *wislizeni*): Medium to large sized tree, common. Texas to California.
109. POPLAR (*Populus grandidentata*): Medium-sized tree, chiefly used for pulp. Maine to Minnesota and southward along the Alleghanies.
110. ASPEN (*Populus tremuloides*): Small to medium sized tree, often forming extensive forests and covering burned areas. Maine to Washington and northward, south in the Western mountains to California and New Mexico.

**SOUR GUM.** (*See* GUM.)

**RED GUM.** (*See* GUM.)

### SASSAFRAS.

111. SASSAFRAS (*Sassafras sassafras*): Wood light, soft, not strong, brittle, of coarse texture, durable; sapwood yellow, heart orange brown. Used in cooperage, for skiffs, fencing, etc. Medium-sized tree, largest in the Lower Mississippi Valley, from New England to Texas and from Michigan to Florida.

**SWEET GUM.** (*See* GUM.)

### SYCAMORE.

112. SYCAMORE (*Platanus occidentalis*) (button wood, button-ball tree, water beech): Wood moderately heavy, quite hard, stiff, strong, tough, usually crossgrained, of coarse texture, and white to light brown color; the wood is

hard to split and work, shrinks moderately, warps and checks considerably, but stands well. It is used extensively for drawers, backs, bottoms, etc., in cabinet-work, for tobacco boxes, in cooperage, and also for finishing lumber, where it has too long been underrated. A large tree, of rapid growth, common and largest in the Ohio and Mississippi valleys, at home in nearly all parts of the Eastern United States. The California species—

113. *Platanus racemosa* resembles in its wood the Eastern form.

#### **TULIP WOOD.**

114. TULIP TREE (*Liriodendron tulipifera*) (yellow poplar, white wood): Wood quite variable in weight, usually light, soft, stiff but not strong, of fine texture, and yellowish color; the wood shrinks considerably, but seasons without much injury; works and stands remarkably well. Used for siding, for paneling and finishing lumber in house, car, and ship building, for sideboards and panels of wagons and carriages; also in the manufacture of furniture, implements and machinery, for pump logs, and almost every kind of common wooden ware, boxes, shelving, drawers, etc. An ideal wood for the carver and toy man. A large tree, does not form forests, but is quite common, especially in the Ohio Basin; occurs from New England to Missouri and southward to Florida.

115. CUCUMBER TREE (*Magnolia acuminata*): A medium-sized tree, most common in the Southern Alleghanies, but distributed from New York to Arkansas, southward to Alabama and northward to Illinois. Resembling, and probably confounded with, tulip wood in the markets.

**TUPELO.** (See GUM.)

#### **WALNUT.**

116. BLACK WALNUT (*Juglans nigra*): Wood heavy, hard, strong, of coarse texture; the narrow sap wood whitish, the heartwood chocolate brown. The wood shrinks moderately in drying, works and stands well, takes a good polish, is quite handsome, and has been for a long time the favorite cabinet wood in this country. Walnut, formerly used even for fencing, has become too costly for ordinary uses, and is to-day employed largely as a veneer, for inside finish and cabinetwork; also in turnery, for gunstocks, etc. Black walnut is a large tree, with stout trunk, of rapid growth, and was formerly quite abundant throughout the Alleghany region, occurring from New England to Texas, and from Michigan to Florida.

**WHITE WALNUT.** (See BUTTERNUT.)

**WHITE WOOD.** (See TULIP, and also BASSWOOD.)

**YELLOW POPLAR.** (See TULIP.)



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BUREAU OF FORESTRY—BULLETIN No. 61.  
GIFFORD PINCHOT, Forester.

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# TERMS USED IN FORESTRY AND LOGGING.

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PREPARED IN COOPERATION WITH  
THE SOCIETY OF AMERICAN FORESTERS.



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## ILLUSTRATION.

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## LETTER OF TRANSMITTAL

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UNITED STATES DEPARTMENT OF AGRICULTURE,  
BUREAU OF FORESTRY,

*Washington, D. C., May 15, 1905.*

SIR: I have the honor to transmit herewith a manuscript entitled "Terms used in Forestry and Logging," prepared in cooperation with the Society of American Foresters, and to recommend its publication as Bulletin No. 61 of the Bureau of Forestry.

The publication of this bulletin in its present form would have been impossible without the cooperation of many lumbermen, and of practically all the trained foresters in the United States.

Very respectfully,

GIFFORD PINCHOT,  
*Forester.*

HON. JAMES WILSON,  
*Secretary of Agriculture.*



# TERMS USED IN FORESTRY AND LOGGING.

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## INTRODUCTION.

The terms in forestry which form a part of this bulletin comprise the English forest terminology used in this country, and the more important German and French equivalents. Many entirely new terms, and modifications of terms already in use, are included to meet the specific needs of American forestry. The Bureau of Forestry will follow this terminology closely in all branches of its work, and it is hoped that foresters generally in the United States will still further standardize it by use.

The terms in logging comprise those commonly employed in work in the woods. Words and phrases which are merely slang, those whose use is so limited as to be of no practical importance, and those of wide application which are in standard dictionaries, have been omitted. No terms used in the mill or to describe its product, or relating to tie making, turpentineing, the production of maple sugar, and other industries which are not essentially a part of the lumberman's work, are included. A list of such terms is now in preparation and will appear in another edition of this bulletin.

Suggestions for the correction or enlargement of the present list are invited, and may be sent to the Forester.

## TERMS IN FORESTRY.

[Terms recommended for use are defined. Terms not recommended are inserted as synonyms.]

**Absolute forest land.** Land fit only for forest growth.

Syn.: absolute forest soil. G., Holzboden. F., sol forestier.

**Absolute forest soil.** *See* Absolute forest land.

**Absolute form factor.** *See* Form factor.

**Accident yield.** Trees which are cut on account of accident, as, for example, damage by wind, snow, insects, or fire.

G., Vorgriffnutzung, Calamitätsnutzung. F., Produits accidentels.

**Accretion, *n.*** Increase in diameter or height; distinguished from *increment*, increase in volume.

**Accretion borer.** An instrument for determining the growth in diameter of standing trees. It consists of a hollow auger, which, when bored into a tree, extracts a section showing the annual rings.

Syn.: increment borer, increment gauge. G., Zuwachsbohrer. F., sonde de Pressler.

**Accretion cutting.** *See* Accretion thinning.

**Accretion thinning.** A thinning made specifically to increase the rate of growth in diameter of the trees which are left standing. *See* Thinning.

Syn.: accretion cutting. G., Lichtungshieb. F., coup d'isolement.

**Acid humus.** *See* Sour humus.

**Actual merchantable length.** *See* Used length.

**Actual merchantable volume.** *See* Used volume.

**Advance growth, *n.*** Young trees which have sprung up in accidental openings in the forest, or under the forest cover before reproduction cuttings are begun. *See* Volunteer growth.

G., Vorwuchs. F., semis préexistant.

**After-growth, *n.*** Young trees which have sprung up as the result of reproduction cuttings.

G., Nachwuchs. F., repeuplement naturel.

**Age class.** All trees in a stand whose ages are within given limits.

G., Altersklasse. F., classe d'âge.

**All-aged forest.** *See* Many-aged forest.

**Annual ring.** The layer of wood produced by the diameter growth of a tree in one year, as seen on a cross section. *See* False ring.

G., Jahrring, Jahresschicht. F., couche annuelle, couche d'accroissement.

**Annual working.** *See* Working.

**Arithmetical mean sample tree.** *See* Sample tree.

**Artificial form factor.** *See* Form factor.

**Artificial reproduction.** *See* Reproduction.

**Aspect, *n.*** The direction toward which a slope faces. The eight main points of the compass, N., NE., E., SE., S., SW., W., NW., are distinguished in forest description.

Syn.: exposure. G., Lage. F., exposition.

**Back fire.** A fire started purposely some distance ahead of a fire which is to be fought. The back fire is intended to burn only against the wind, so that when the two fires meet, both must go out for lack of fuel.

Syn.: counter fire. G., Gegenfeuer. F., contre feu.

**Ball planting.** A method of transplanting young trees with balls or lumps of earth around the roots.

G., Ballenpflanzung. F., plantation en motte.

**Bark blazer.** *See* Scratcher.

**Bark gouge.** *See* Scratcher.

**Basal area.** The area of a cross section of a tree, or the sum of such areas.

**Blank, *n.*** An opening in the forest where, from any cause, very few or no trees are growing.

G., Blösse. F., vide.

**Block, *n.*** The unit of management treated in a working plan. A block contains always two, but usually many more, compartments.

G., Block. F., série d'exploitation.

**Board foot.** The contents of a board 1 foot square and 1 inch thick. The common unit of measure for logs and lumber in the United States.

**Board measure.** The standard of lumber measurement, the unit of which is the board foot.

Syn.: board scale.

**Board rule.** A graduated stick for determining the contents of boards. The number of board feet in boards of given widths and lengths is shown upon the stick.

**Board scale.** *See* Board measure.

**Bole, n.** *See* Stem.

**Breasthigh, a.** At or having a height of  $4\frac{1}{2}$  feet above the ground.

**Burn, n.** An area over which fire has run to the noticeable injury of the forest.

**Caliper, n.** An instrument for measuring the diameter of trees or logs, usually consisting of a graduated beam to which is attached one fixed and one sliding arm.

G., Kluppe. F., compas forestier.

**Canopy, n.** *See* Crown cover.

**Class sample tree.** *See* Sample tree.

**Clean cutting, 1.** The cutting of the entire stand.

Syn.: clear cutting. G., Kahlschlag. F., coupe blanche, coupe à blanc étoe.

2. An area upon which the entire stand has been cut.

**Clean cutting method.** A method of conservative lumbering in which the entire stand is cut at one time and reproduction is secured by sowing or planting. *See* Forest management.

G., Kahlschlagwirtschaft. F., méthode par coupe unique.

**Cleaning, n.** A thinning made in a stand which has not reached the small-pole stage. Its main object is to remove trees of undesirable form and species. *See* Thinning.

G., Reinigungshieb. F., nettolement.

**Clear cutting.** *See* Clean cutting.

**Clear length.** In silvics, that portion of the stem of a tree free from branches. In forest measurements the meaning of the term varies with the species measured and the purpose of the measurements. For example, clear length is in some cases used to designate that portion of the stem entirely free from branches, in others that portion free from dead branches, or from growing branches of a given size.

Syn.: clear trunk. G., Stamm. F., tige.

**Clear trunk.** *See* Clear length.

**Closed, a.** *See* Crown density.

**Combined cropping.** The combination of forest and field crops on the same area.

G., Waldfeldbau. F., culture agricole et sylvicole combinée.

**Communal forest.** *See* Town forest.

**Compartment, n.** The unit of area treated in the working plan. The size and the shape of compartments are determined mainly by topographic features.

G., Abteilung, Jagen. F., parceller, division, compartiment.

If a compartment contains a stand varying greatly in composition, age, or needs, it may be divided into two or more *subcompartments*, which may be either temporary or permanent.

**Compartment line.** The boundary of a compartment. It may be marked by a road, a ride, or a natural feature, such as a stream or the crest of a ridge. In Europe, when other demarcation is wanting, clean cuttings upon narrow strips are made to mark the boundaries of a compartment. These are known as rides (G., Schneisse. F., laie). A ride which separates two cutting series, and thus runs parallel to the prevailing wind direction, is called a *major ride* (G., Wirtschaftsstreifen. F., laie sommière), while one which completes the demarcation of a compartment is known as a *minor ride* (G., Nebenschneisse. F., layon).

**Compartment system.** *See* Stand method.

**Composite forest.** A forest in which both seedlings and sprouts occur in considerable number. It may be either pure or mixed.

Syn.: mixed seedling and sprout forest.

**Composite system.** One of the three great systems of forest management. Under it reproduction is secured by both sprouts and seedlings. *See* Forest management.

**Conservative lumbering.** Practical forestry; any method of lumbering which perpetuates the forest by use.

**Conversion, *n.*** A change from one system or method of forest management to another, as from the sprout system to the seed system.

G., Überführung, Umwandlung. F., conversion.

**Conversion period.** The period during which the change from one system or method of forest management to another is effected.

**Coppice, coppice forest.** *See* Sprout forest.

**Coppice method.** *See* Sprout method.

**Coppice shoot.** *See* Sprout.

**Coppice system.** *See* Sprout system.

**Coppice with standards.** *See* Reserve sprout forest.

**Counter fire.** *See* Back fire.

**Crown, *n.*** In silvics, the upper part of a tree, including the living branches with their foliage. In forest measurements the use of the term varies with the kind of tree and the purpose of the measurements. For example, crown may be used to designate the whole leaf and branch system, or that portion of it above a dead or a growing branch of a given size. In tree description the crown is described as long or short, broad or narrow, compact or ragged, conical or flat.

G., Krone. F., cime.

**Crown canopy.** *See* Crown cover.

**Crown class.** All trees in a stand occupying a similar position in the crown cover. *Dominant, intermediate, overtopped, and suppressed* trees each constitute a crown class.

**Crown cover.** The canopy formed by the crowns of all the trees in a forest, or, in an irregular forest, by the crowns of all trees in a specified crown class.

Syn.: canopy, crown canopy, leaf canopy. G., Kronendach, Beschirmung. F., couvert, voûte foliacée.

**Crown density.** The density of the crowns of the trees in a forest; it is usually measured by the extent to which the ground is shaded.

G., Beschirmungsdichte. F., épaisseur du couvert.

The degrees of crown density in a forest are expressed by the following terms:

**Closed.** When the crowns form an uninterrupted cover and permit little or no sunlight to reach the ground. G., geschlossen. F., plein.

**Dense.** When three-fourths or more of the ground is shaded. G., dicht. F., dense.

**Thin.** When three-fourths to one-half of the ground is shaded by the crowns. G., licht. F., clair.

**Open.** When less than one-half the ground is shaded by the crowns. G., lückig. F., entrecoupé.

**Park forest** is forest in which shade occurs only in isolated patches, under single trees or small groups.

**Crown fire.** *See* Forest fire.

**Crown forest.** *See* National forest.

**Cruiser's bark blazer.** *See* Scratcher.



**Cull, *v.*** To take out of a forest by selection a portion of the trees.

**Culled forest.** Forest from which cuttings by selection have removed a portion of the trees.

**Current annual increment.** The volume of wood produced in a given year by the growth of a tree or stand.

**Cut over, *to.*** To cut most or all of the merchantable timber in a forest.

**Cut-over forest.** Forest in which most or all of the merchantable timber has been cut.

**Cutting area.** The area over which cuttings are to be or have been made.

G., Schlag. F., coupe.

**Cutting height.** The height above the ground at which a tree is to be cut. *See* Stump height.

**Cutting limit.** *See* Diameter limit.

**Cutting series.** A block or a part of a block containing even-aged stands whose ages differ uniformly within given limits and which are to be cut in turn, the cuttings usually following a given direction. A perfect cutting series seldom exists, except under the clean-cutting method followed by artificial reproduction, or under the sprout method.

G., Hiebszug. F., suite des coupes.

**Deaden, *v.*** To kill a standing tree by girdling it.

G., ringeln. F., ceinturer.

**Deadenig, *n.*** An area upon which the trees have been deadened.

**Dense, *a.*** *See* Crown density.

**Diameter breasthigh.** The diameter of a tree at 4½ feet above the ground.

**Diameter class.** All trees in a stand whose diameters are within prescribed limits.

G., Stärkeklasse. F., catégorie de grosseur.

**Diameter growth.** The increase in diameter of a tree.

G., Dickenwachstum. F., croissance en diamètre.

**Diameter limit.** The diameter, usually breasthigh, which defines the size to which trees are to be measured or used for any given purpose.

Syn.: cutting limit.

**Diameter tape.** A tape for ascertaining the diameter of trees, so graduated that the diameter corresponding to the girth of a tree is read directly from the tape.

**Dibble, *n.*** A tool for making holes for planting seeds or young trees.

G., Setzpfahl. F., plançon.

**Dibble in, *to.*** To plant seeds or young trees in holes made with a dibble.

**Direct returns.** *See* Forest products.

**Dominant, *a.*** Having the crown free to light on all sides because of greater height. *See* Crown class.

G., herrschend. F., dominant.

**Drill planting.** *See* Row planting.

**Dry pruning.** *See* Pruning.

**Dry topped.** Having a dead or a partially defoliated crown, or discolored foliage, as the result of injury or disease.

Syn.: stagheaded. G., gipfeldürr. F., couronné.

**Duff, *n.*** *See* Litter.

**Even-aged forest.** *See* Regular forest.

**Expectation value.** *See* Forest expectation value.

**Experiment area.** A forest area of known size upon which successive measurements or other detailed studies are made for the determination of the growth and behavior of the stand, or upon which experiments are conducted to ascertain the effect of methods of treatment upon the forest. *See* Valuation area.

Syn.: permanent sample plot, permanent sample area. G., Probefläche, Versuchsfäche. F., surface d'expérience, place d'essai.

**Exposure.** *See* Aspect.

**Factor of shape.** *See* Form factor.

**Factors of the locality.** *See* Locality.

**Fail spot.** A place where natural or artificial reproduction has failed.

**False ring.** The layer of wood, less than a full season's growth, and seldom extending around the stem, which is formed whenever the diameter growth of a tree is interrupted and begins again during the same growing season.

G., Scheinring. F., fausse couche d'accroissement.

**Federal forest.** *See* National forest.

**Federal forest reserve.** *See* National forest reserve.

**Final cutting.** *See* Stand method.

**Final yield.** All material derived from reproduction cuttings or clean cuttings. It is usually the chief crop, and marks the end of the rotation. *See* Intermediate yield.

G., Haubarkeitsnutzung, Abtriebsnutzung. F., produit principal.

**Financial rotation.** *See* Rotation.

**Fire lane.** *See* Fire line.

**Fire line.** A strip kept clear of inflammable material as a protection against the spread of forest fire.

Syn.: fire lane, fire trace. G., Feuergestell. F., tranchée garde-feu.

**Fire trace.** *See* Fire line.

**First growth.** 1. Natural forest in which no cuttings have been made. *See* Second growth.

Syn.: old growth, virgin forest. G., Urwald. F., forêt vierge.

2. Trees grown before lumbering or severe fire entered the forest; belonging to the original stand.

**Forest, c.** To establish a forest, either by natural or artificial means.

**Forest, n.** An area whose principal crop is trees. A forest includes both the forest cover and the soil beneath it.

G., Wald, Forst. F., forêt.

A forest judged by the character of the stand may be *timberland* or *woodland*. These constitute the two great classes of forest, between which it is possible to draw a practical but not an absolute distinction.

*Timberland* may be broadly defined as that class of forest which contains in commercial quantities trees of sufficient size and of the required kind to furnish saw logs, pulp wood, ties, poles, or wood for similar uses.

*Woodland* may be broadly defined as forest which contains trees fit for firewood or fencing, but none or very few trees which are suitable for the uses enumerated above.

A *timber tract* is a body of timberland, usually of large area.

A *woodlot* is a forest of small area in which the wood is used mainly for fuel, fencing, and other farm purposes.

**Forestation.** *See* Forest extension.

**Forest capital.** The capital which a forest represents. It consists of the forest land, or fixed capital, and the stand.

G., Waldkapital. F., capital forestier.

**Forest cover.** All trees and other plants in a forest.

**Forester, n.** One who practices forestry as a profession.

**Forest expectation value.** The present net value of all future returns expected from the forest capital. It is determined by discounting to the present time, at compound interest, all returns and expenses anticipated.

G., Erwartungswert. F., valeur d'avenir.

**Forest extension.** The establishment of forest upon areas where it is at present absent or insufficient.

Syn.: forestation.

**Forest finance.** See Forest management.

**Forest fire.** A fire in timberland or woodland. A forest fire may be a *ground fire*, a *surface fire*, a *stand fire*, or a *crown fire*. A *ground fire* is one which burns in the forest floor and does not appear above the ground. When a fire runs over the surface or burns the undergrowth, it is a *surface fire*. When a surface fire spreads from the undergrowth to the stand, igniting the trees, it becomes a *stand fire*. Under certain conditions the crowns of the trees may be ignited, causing a *crown fire*.

**Forest floor.** The deposit of vegetable matter on the ground in a forest. *Litter* includes the upper, but slightly decomposed portion of the forest floor; *humus*, the portion in which decomposition is well advanced.

**Forest grown.** Grown in the forest from self-sown seed.

**Forest humus.** See Mild humus.

**Forest influences.** All effects resulting from the presence of the forest, upon health, climate (including wind, rainfall, temperature, etc.), stream flow, and economic conditions.

Syn.: indirect effects.

**Forest management.** The practical application of the principles of forestry to a forest area. See Forestry.

Forest management includes *Forest mensuration*, or the determination of the present and future product of the forest (G., Holzmesskunde. F., cubage); *Forest organization*, or the preparation of working plans and planting plans, detailed and comprehensive schemes for the establishment and best use of the forest (G., Forst-inrichtung. F., aménagement); and *Forest finance*, or the determination of the money returns from forestry (G., Forstfinanzen. F., finance forestière).

Three great systems of forest management are distinguished: The *seed system*, the *sprout system*, and the *composite system*. The seed system includes the *stand method*, *group method*, *strip method*, *patch method*, *strip stand method*, *group seed method*, *scattered seed method*, *single tree method*, *reserve seed method*, *clean cutting method*. The sprout system includes the *sprout method*. The composite system includes the *reserve sprout method*.

**Forest mensuration.** See Forest management.

**Forest nursery.** An area upon which young trees are grown for forest planting.

G., Baumschule, Saatkamp. F., pépinière.

**Forest organization.** See Forest management.

**Forest plantation.** Forest growth, established by setting out young trees or by sowing seed, which has not reached the small pole stage.

G., Pflanzung, Kultur. F., plantation.

A forest plantation, made by setting out young trees, which has passed the small pole stage, is called a *planted forest*. A sown forest plantation which has passed the small pole stage is called a *sown forest*.

**Forest policy.** The principles which govern the administration of the forest for its best permanent use. *See* Forestry.

G., Forstpolitik. F., politique forestière.

**Forest products.** All usable material yielded by the forest.

Syn.: direct returns.

The following classes are distinguished:

*Major products* include all wood harvested for any purpose.

G., Hauptnutzung. F., produits principaux.

*Minor products* include all forest products except wood.

G., Nebenutzung. F., menus produits.

**Forest protection.** The safeguarding of the forest against any damage not caused by its own growth. *See* Forestry.

G., Forstschutz. F., protection des forêts.

**Forestral, a.** Pertaining to forestry.

**Forest replacement.** The restoration of forest growth on denuded areas.

G., Wiederaufforstung. F., reboisement.

**Forestry, n.** The science and art of making the best permanent use of the forest.

G., Forstwirtschaft, Forstwesen, Forstwissenschaft. F., science forestière, for-  
esterie.

The main branches of forestry are *Forest policy*, *Silriculture*, *Forest management*, *Forest protection*, and *Forest utilization*.

**Forest type.** A forest or a part of a forest possessing distinctive characteristics of composition or habit of growth.

**Forest utilization.** The most profitable use of forest products. *See* Forestry.

G., Forstbenutzung. F., exploitation des bois.

**Form class.** All trees in a stand so similar in form that the same form factor is applicable in determining their actual volume.

Syn.: form factor class.

**Form factor.** The ratio, expressed decimally, between the volume of a tree, or portion of a tree, and of a cylinder of the same height and diameter. The volume of this cylinder multiplied by the form factor gives the actual volume of the tree or portion of the tree.

Syn.: factor of shape. G., Formzahl. F., coefficient de forme.

Three kinds of form factors are distinguished, according to the portion of the tree to which they refer:

A *Tree form factor* is used for determining the actual volume of the whole tree; a *Stem form factor* for determining the volume of the stem; and a *Timber form factor* for determining the merchantable contents of stem, crown, or both.

A form factor is called *absolute* when the diameter of the tree is measured at any convenient height, the form factor referring only to that portion of the tree above the point at which the diameter is measured; *normal*, when the diameter is measured at a height in constant ratio to the total height of the tree; and *artificial*, when the breasthigh diameter is measured.

**Form factor class.** *See* Form class.

**Future yield.** The amount of wood which given trees upon a given area will contain after a given period.

**Future yield table.** A tabular statement of future yield.

**Green pruning.** *See* Pruning.

**Ground cover.** All small plants growing in a forest, except young trees; such as ferns, mosses, grasses, and weeds. *See* Underbrush.

G., Bodendecke. F., couverture du sol.

**Ground fire.** *See* Forest fire.

**Group method.** A method of conservative lumbering in which groups of young trees which have sprung up in openings caused by logging, insect damage, wind-fall, snowbreak, or other agency, are taken as starting points for the future forest; or if these are insufficient, small openings are purposely made. Reproduction by self-sown seed from the mature stand at the edges of these groups is secured by careful cuttings, which extend the groups until they join. *See* Forest management.

Syn.: group system, shelterwood group system. G., Horst und gruppenweise Verjüngung, Gruppenwirtschaft.

**Group mixture.** A mixed forest in which trees of the same species occur in groups not large enough to be considered pure stands.

**Group seed method.** A method of conservative lumbering in which the forest is reproduced after a single cutting, by leaving in groups seed trees of the kind desired. *See* Forest management.

**Group system.** *See* Group method.

**Growing stock.** *See* Stand.

**Habit, n.** *See* Silvics.

**Harden off, to.** To prepare seedlings in the seedbed for transplanting by gradually exposing them to wind and sunlight.

**Heel in, to.** To store young trees for planting by laying them against the side of a trench and covering the roots with earth.

**Height class.** All trees in a stand whose heights are within prescribed limits.

G., Höhenklasse. F., classe de hauteur.

**Height growth.** The increase in height of a tree.

G., Höhenwuchs. F., croissance en hauteur.

**Height measure.** An instrument for measuring the height of a tree.

Syn.: hypsometer. G., Höhenmesser. F., dendromètre.

**High forest.** *See* Seed forest.

**High forest compartment system.** *See* Stand method.

**High or seedling forest system.** *See* Seed system.

**High pole.** *See* Pole.

**Hill planting.** *See* Mound planting.

**Humus, n.** That portion of the forest floor in which decomposition is well advanced.

Syn.: mold. G. and F., Humus.

**Hypsometer, n.** *See* Height measure.

**Improvement cutting.** *See* Improvement thinning.

**Improvement thinning.** Usually the first thinning made when a forest is put under management, to prepare it for the application of a regular system. *See* Thinning.

Syn.: improvement cutting, preliminary thinning. G., Verbesserungshieb. F., coupe d'amélioration.

**Income rotation.** *See* Rotation.

- Increment, *n.*** The volume or value of wood produced during a given period by the growth of a tree or of a stand. *See* Accretion.  
 Syn.: volume growth. G., Zuwachs. F., accroissement.  
 Three kinds of increment are distinguished:  
*Volume increment* is the increase in volume of a tree or stand.  
*Quality increment* is the increase in value per unit of volume.  
*Price increment* is the increment resulting from an increase in the price of forest products independent of quality increment.
- Increment borer.** *See* Accretion borer.
- Increment gauge.** *See* Accretion borer.
- Index, *a.*** The highest average actually found upon a given locality. The term index applied to stand, diameter growth, height growth, increment, and present and future yield is the equivalent of *normal*, when normal is used to describe the assumed standard based upon actual measurement.  
 Syn.: normal. G. and F., normal.
- Index forest.** That forest which in density, volume, and increment reaches the highest average which has been found upon a given locality. Measurements of such a forest provide a standard for comparison with other forests of the same age and composition, grown under similar conditions.  
 Syn.: normal forest.
- Indirect effects.** *See* Forest influences.
- Intermediate, *a.*** Having the crown shaded on the sides, but free to light at the top. *See* Crown class.
- Intermediate yield.** All material from thinnings or from any cutting not intended to invite or assist reproduction. *See* Final yield.  
 G., Zwischennutzung. F., produits intermédiaires.
- Intermittent Working.** *See* Working.
- Intolerant, *a.*** Incapable of enduring heavy shade.  
 Syn.: light demanding. G., lichtbedürftig. F., à tempérament robuste.
- Irregular forest.** Forest in which the trees differ considerably in age.  
 Syn.: uneven-aged forest. G., ungleichalteriger Bestand. F., peuplement mêlé.
- Large pole.** *See* Pole.
- Large-pole forest.** A forest of large poles.
- Large sapling.** *See* Sapling.
- Large-sapling forest.** A forest of large saplings.
- Leaf canopy.** *See* Crown cover.
- Leaf cover.** *See* Litter.
- Leaf litter.** *See* Litter.
- Lift, *v.*** To pry up seedlings in the seedbed, so that they may be pulled up by hand for transplanting.
- Light demanding.** *See* Intolerant.
- Light screen.** *See* Shade frame.
- Line out, *to.*** To transplant seedlings from the seedbed to rows in the forest nursery.  
 G., verschulen. F., repiquer.
- Litter, *n.*** That portion of the forest floor which is not in an advanced state of decomposition.  
 Syn.: leaf litter, leaf cover, duff. G., Streu. F., litière.

**Locality, *n.*** An area, considered with reference to forest-producing power; the *factors of the locality* are the altitude, soil, slope, aspect, and other local conditions influencing forest growth.

Syn.: site. G., Standort. F., station.

**Locality class.** All localities with similar forest-producing power.

Syn.: quality of locality. G., Standortsgüte, Standortsbonität, Bonität. F., qualité de la station.

**Log rule, 1.** A tabular statement of the amount of lumber which can be sawed from logs of given lengths and diameters.

**2.** A graduated stick for measuring the diameters of logs. The number of board feet in logs of given diameters and lengths is shown upon the stick.

Syn.: log scale, scale rule.

**Log scale.** See Log rule.

**Lower story.** See Two-storied forest.

**Low pole.** See Pole.

**Major products.** See Forest products.

**Major ride.** See Compartment line.

**Many-aged forest.** A forest through all parts of which many different age classes of trees tend to distribute themselves. When all age classes are thus distributed, the forest is *all-aged*. These two terms replace *selection forest*, many-aged being substituted for imperfect selection, and all-aged for perfect or ideal selection.

**Marking hatchet.** A hatchet for marking trees. A raised die is cut on the head for stamping the face of the blaze.

**Mature forest.** Forest so old that growth in height is practically at an end and diameter growth is decreasing.

**Mean annual increment.** The total increment of a tree or stand divided by its age in years.

**Merchantable length.** The total length of that portion of the stem which can be used under given conditions.

Syn.: possible merchantable length.

**Merchantable volume.** The total volume of that portion of the tree which can be used under given conditions.

Syn.: possible merchantable volume.

**Method of successive thinnings.** See Stand method.

**Mild humus.** Humus in a condition favorable to forest growth.

Syn.: forest humus. Ant.: sour humus. G., milder Humus. F., terreau forestier.

**Minor products.** See Forest products.

**Minor ride.** See Compartment line.

**Mixed forest.** Forest composed of trees of two or more species.

G., gemischter Bestand. F., peuplement mélangé.

**Mixed seedling and sprout forest.** See Composite forest.

**Mold, *n.*** See Humus.

**Mother tree, *n.*** See Seed tree.

**Mound planting.** A method of planting on wet ground, in which the seeds or young trees are planted on mounds, ridges, or hills.

Syn.: hill planting, ridge planting. G., Hügelpflanzung. F., plantation en buttes.

**National forest.** A forest which is the property of the United States.

Syn.: federal forest.

Forest belonging to the National Government is in G., Staatswald; F., forêt domaniale, and in the British dependencies, Crown forest.

**National forest reserve.** A tract of land set apart from the public domain by proclamation of the President under section 24 of the act of March 3, 1891, or created by special act of Congress, and administered under laws of the United States passed for that purpose, in order "to improve and protect the forest within the reservation, or for the purpose of securing favorable conditions of waterflows and to furnish a continuous supply of timber for the use and necessities of citizens of the United States."

Syn.: Federal forest reserve.

**National park.** A tract of Government land withdrawn by special act of Congress from settlement, occupancy, or sale, under the laws of the United States, for the benefit and enjoyment of the people.

**Natural pruning.** *See* Pruning.

**Natural reproduction.** *See* Reproduction.

**Normal, a.** *See* Index.

**Normal forest.** *See* Index forest.

**Normal form factor.** *See* Form factor.

**Nurse, n.** A tree which fosters the growth of another in youth.

G., Schutzholz. F., essence d'abri.

**Nursery grown.** Grown in a forest nursery.

**Old-field growth.** *See* Volunteer growth.

**Old growth.** *See* First growth.

**Open, a.** *See* Crown density.

**Overmature forest.** Forest in which, as the result of age, growth has almost entirely ceased, and decay and deterioration have begun.

**Overtopped, a.** Having the crown shaded from above, although a side or sides may be free to light. *See* Crown class.

**Overwood, n.** *See* Two-storied forest.

**Park forest.** *See* Crown density.

**Partial section analysis.** *See* Tree analysis.

**Partial stump analysis.** *See* Tree analysis.

**Patch method.** The clean cutting of small patches to invite reproduction by self-sown seed from the surrounding forest. *See* Forest management.

G., Kesselhieb, Löcherhieb. F., coupes par trouées.

**Patch sowing.** Sowing forest seed in spots. *See* Seed spot.

G., Plätzeaat, Plattensaat. F., semis par places.

**Periodic annual increment.** The total increment for the period, divided by the number of years in the period. *See* Periodic increment.

**Periodic increment.** The volume of wood produced by the growth of a tree or stand in a specified number of years.

**Periodic working.** *See* Working.

**Permanent sample area.** *See* Experiment area.

**Permanent sample plot.** *See* Experiment area.

**Physical rotation.** *See* Rotation.

**Pit planting.** *See* Trench planting.



**Planted forest.** *See* Forest plantation.

**Planting plan.** A detailed scheme for forest planting on a given area.

**Planting site.** An area which is to be artificially stocked with forest growth.

**Plot survey.** *See* Valuation survey.

**Pole, n.** A tree from 4 to 12 inches in diameter breasthigh. *See* Tree class.

G., Stange. F., perche.

A *small pole* is a tree from 4 to 8 inches in diameter breasthigh.

Syn.: low pole.

A *large pole* is a tree from 8 to 12 inches in diameter breasthigh.

Syn.: high pole.

**Pollard, v.** To invite the production of shoots at the top of a tree by cutting back the crown.

G., köpfen. F., étêter, écimer.

**Pollard, n.** A tree whose crown has been cut back to invite the production of shoots.

G., Kopfholz. F., têtard.

**Possible merchantable length.** *See* Merchantable length.

**Possible merchantable volume.** *See* Merchantable volume.

**Preliminary examination.** A reconnoissance of a forest to determine whether the preparation of a working plan for its management is advisable, or a reconnoissance to determine the advisability of forest planting.

**Preliminary thinning.** *See* Improvement thinning.

**Preparatory cuttings.** *See* Stand method.

**Preparatory stage.** *See* Stand method.

**Present yield.** The amount of wood at present contained in given trees upon a given area.

G., Vorrath. F., matériel debout, matériel sur pied.

**Present yield table.** A tabular statement of the amount of wood at present contained in given trees upon a given area.

**Price increment.** *See* Increment.

**Private forest.** A forest which is the property of an individual, corporation, company, or private institution. G., Privatwald. F., forêt particulière.

**Protection forest.** A forest whose chief value is to regulate stream flow, prevent erosion, hold shifting sand, or exert any other indirect beneficial effect.

G., Schutzwald, Bannwald. F., forêt de protection.

**Pruning, n.** The removal of branches from standing trees by natural or artificial means.

G., Aufästung. F., élagage.

The clearing of the stem through the death and fall of branches for want of light is known as *natural pruning*. (G., Astreinigung. F., élagage naturel.) When living branches are removed by cutting them close to the stem the operation is known as *green pruning* (G., Grünästung. F., élagage de branches vivantes); when it is confined to dead branches, as *dry pruning* (G., Trockenästung. F., élagage de branches mortes).

**Puddle, v.** To dip the roots of young trees in thin mud.

**Puddle, n.** A mixture of soil or mold and water, forming thin mud, in which the roots of young trees are dipped to retard drying out during transplanting.

**Pure forest.** Forest composed of trees of one species. In practice, a forest in which 80 per cent of the trees are of one species.

G., reiner Bestand. F., peuplement pur.

**Quality increment.** *See* Increment.

**Quality of locality.** *See* Locality class.

**Quincunx planting.** A method of planting in which young trees are set in the center and at each corner of successive squares.

G., Fünferverband, Kreuzpflanzung. F., plantation en quinconce.

**Reforest, *v.*** *See* Restock.

**Regeneration, *n.*** *See* Reproduction.

**Regeneration cutting.** *See* Reproduction cutting.

**Regular forest.** Forest in which the trees are approximately of the same age.

Syn.: even-aged forest. G., gleichalteriger Bestand. F., peuplement uniforme.

**Removal cuttings.** *See* Stand method.

**Removal stage.** *See* Stand method.

**Reproduction, *n.*** 1. The process by which a forest is renewed.

Syn.: regeneration. G., Verjüngung. F., régénération.

*Natural reproduction* is the renewal of a forest by self-sown seeds or by sprouts.

G., natürliche Verjüngung. F., régénération naturelle.

*Artificial reproduction* is the renewal of a forest by sowing or planting.

G., künstliche Verjüngung. F., régénération artificielle.

2. Seedlings or saplings from sprouts or from self-sown seed.

**Reproduction cutting.** Any cutting intended to invite or assist reproduction.

Syn.: regeneration cutting. G., Verjüngungshieb. F., coupe de régénération.

**Reproduction period.** The space of time required for the renewal of a stand.

**Reserve seed method.** That method of conservative lumbering in which, in a stand which is being reproduced by self-sown seed, a number of trees are left uncut for a period, usually a second rotation, after the stand itself is reproduced. *See* Forest management.

Syn.: system of high forest with standards. G., Ueberhaltbetrieb. F., traitement en futaie avec réserve sur coupe définitive.

**Reserve sprout forest.** Two-storied forest, in which sprouts form the lower and seedlings, or selected, healthy sprouts, the upper story.

Syn.: coppice with standards, standard coppice, stored coppice. G., Mittelwald. F., taillis composé, taillis sous futaie.

**Reserve sprout method.** That method of conservative lumbering in which an overwood composed of seedling trees, or selected sprouts, is maintained above a stand of sprouts. *See* Forest management.

Syn.: standard coppice system. G., Mittelwaldbetrieb. F., régime du taillis composé.

**Restock, *v.*** To renew a forest, either by natural or artificial means.

Syn.: reforest. G., aufforsten. F., reboiser.

**Ride, *n.*** *See* Compartment line.

**Ridge planting.** *See* Mound planting.

**Rock, *n.*** In forest description rock refers to those characteristics of the underlying formation which affect the forest; as, for example, its outcrop, composition, and the rapidity of its disintegration.

**Rock in, *to.*** To plant young trees in openings in the ground made by prying or rocking a spade back and forth.

**Root collar.** That place at the base of a tree where the swelling which is the direct result of the ramifications of the roots begins.

G., Wurzelhals. F., collet.

**Root sucker.** *See* Sprout.

**Rotation, n.** The period represented by the age of a forest, or a part of a forest, at the time when it is cut, or intended to be cut.

G., Umtrieb, Umtriebszeit. F., révolution.

The following classes of rotation are distinguished:

*Financial rotation*, under which a forest yields the highest net interest on its capital value, calculating at compound interest.

*Income rotation*, under which a forest yields the highest net return, calculating without interest.

Syn.: rotation of the highest income.

*Silvical rotation*, the rotation most favorable to the natural reproduction of the forest under a given method.

Syn.: physical rotation, silvicultural rotation.

*Technical rotation*, under which a forest yields the material most suitable for a certain purpose.

*Volume rotation*, under which a forest yields the greatest quantity of material.

Syn.: rotation of the greatest volume.

**Rotation of the greatest volume.** *See* Rotation.

**Rotation of the highest income.** *See* Rotation.

**Row planting.** A method of planting in which the young trees are placed in rows, the distance between the rows being greater than the distance between the young trees in the rows. In planting seeds or seedlings in the forest nursery this method is known as *drill planting*.

G., Reihenzpflanzung. F., plantation en lignes.

**Sample area.** *See* Valuation area; Experiment area.

**Sample plot.** *See* Valuation area; Experiment area.

**Sample tree.** A tree which in diameter, height, and volume is representative of a tree class.

G., Probestamm. F., tige d'expérience.

A *class sample tree* is a tree which in diameter, height, and volume represents the average of several tree classes.

Syn.: arithmetical mean sample tree.

**Sapling, n.** A tree 3 feet or over in height, and less than 4 inches in diameter breasthigh. *See* Tree class.

A *small sapling* is a sapling from 3 to 10 feet in height.

A *large sapling* is a sapling 10 feet or over in height.

**Scald, n.** *See* Sun scald.

**Scale rule.** *See* Log rule.

**Scattered seed method.** That method of conservative lumbering in which reproduction is provided for by leaving, after a single cutting, scattered seed trees of the kind desired. *See* Forest management.

**Scratcher, n.** An instrument used for marking trees. It usually consists of a hook-like gouge fastened to a flat, elliptical iron hoop, with wooden handle plates on the opposite side from the gouge.

Syn.: bark blazer, bark gouge, cruiser's bark blazer, tree scribe. G., Risser. F., griffe.

**Screen, n.** *See* Shade frame.

**Second growth.** Forest growth which comes up naturally after cutting, fire, or other disturbing cause. *See* First growth.

**Section analysis.** *See* Tree analysis.

**Seedbed, *n.*** A specially prepared area, usually in the forest nursery, for the raising of seedlings.

G., Saatbeet. F., couche de semis.

**Seed cuttings.** *See* Stand method.

**Seed forest.** A forest composed wholly or mainly of trees grown from seed.

Syn.: high forest. G., Hochwald, Samenwald. F., futaie, haute futaie.

**Seedling stage.** *See* Stand method.

**Seedling, *n.*** 1. A tree grown from seed.

G., Kernwuchs. F., brin de semence.

2. A tree grown from seed which has not reached a height of 3 feet. *See* Tree class.

G., Sämling, Keimling. F., jeune brin.

**Seed spot.** A small area, usually in a burn or in an opening in the forest, which is sown with tree seed.

**Seed system.** One of the three great systems of forest management. Under it reproduction is obtained from seed. *See* Forest management.

Syn.: high or seedling forest system. G., Hochwaldbetrieb, Samenholzbetrieb. F., régime de la futaie.

**Seed tree, *n.*** Any tree which bears seed; specifically, a tree which provides the seed for natural reproduction.

Syn.: mother tree. G., Mutterbaum, Samenbaum. F., porte-graine, semencier.

**Seed year.** A year in which a given species of tree bears seed; specifically, a year in which a given species bears seed abundantly.

G., Samenjahr. F., année de semence.

**Selection forest.** *See* Many-aged forest.

**Selection method or system.** *See* Single tree method.

**Self-sown seed.** Strictly, disseminated without the intervention of human or animal agency; in common practice, seed sown by any agency other than man.

**Semimature forest.** Forest in which rapid growth in height has culminated, but diameter growth has not begun to fall off.

**Severance cutting.** The cutting of all trees upon a narrow strip before natural pruning has far advanced, in order that the trees bordering this strip may, as the result of partial exposure, become wind-firm through the development of strong roots. Thus severance cuttings are made to strengthen the trees on the edge of a stand which will later be entirely exposed through the removal of the stand which now protects it.

G., Loshieb. F., essartement de protection.

**Shade-bearing, *a.*** *See* Tolerant.

**Shade-enduring, *a.*** *See* Tolerant.

**Shade frame.** A frame for the partial shading of a seedbed. It consists of a cover of laths, brush, or cloth, supported on posts and arranged so that light can be admitted as desired.

Syn.: light screen, screen.

**Skaff, *n.*** *See* Stem.

**Shelterbelt, *n.*** Natural or artificial forest maintained as a protection from wind or snow.

Syn.: shelterwood, wind mantle. G., Waldmantel, Schutzmantel. F., rideau.

A narrow shelterbelt in which true forest conditions do not exist, is a *windbreak* when maintained as a protection against wind, and a *snowbreak* when maintained as a protection against snow.

**Shelterwood, *n.*** *See* Shelterbelt.

**Shelterwood compartment system.** *See* Stand method.

**Shelterwood group system.** *See* Group method.

**Shelterwood selection system.** *See* Single tree method.

**Shoot, *n.*** *See* Sprout.

**Silvical, *a.*** Pertaining to silvics.

**Silvical rotation.** *See* Rotation.

**Silvics, *n.*** 1. The science which treats of the life of trees in the forest.

2. The habit or behavior of a tree in the forest.

Syn.: habit, silvicultural characteristics.

**Silvicultural characteristics.** *See* Silvics.

**Silvicultural rotation.** *See* Rotation.

**Silviculture, *n.*** The art of producing and tending a forest; the application of the knowledge of silvics in the treatment of a forest. *See* Forestry.

G., Waldbau, Holzzucht. F., sylviculture.

**Single tree method.** That method of conservative lumbering in which reproduction from self-sown seed under the shelter of the old stand is invited by the cutting of single trees. This cutting may be made throughout the forest, as in some woodlots, or in definite portions of the forest in turn. *See* Forest management.

Syn.: selection method, selection system, shelterwood selection system. G., Planzerbetrieb, Planzerwirtschaft, Femelbetrieb. F., jardinage, regime de la futaie jardinee.

**Single tree mixture.** A mixture in which trees of different species occur singly.

**Site, *n.*** *See* Locality.

**Slope, *n.*** The gradient of the land surface. In forest description the following terms are used to define the slope, each of which has its equivalent in percentages of the horizontal distance and in degrees:

Level	=	0- 5%	=	0- 3.0°
Gentle	=	5- 15%	=	3.0- 8.5°
Moderate	=	15- 30%	=	8.5-16.5°
Steep	=	30- 50%	=	16.5-26.5°
Very steep	=	50-100%	=	26.5-45.0°
Precipitous	=	over 100%	=	over 45.0°

**Small pole.** *See* Pole.

**Small-pole forest.** A forest of small poles.

**Small sapling.** *See* Sapling.

**Small-sapling forest.** A forest of small saplings.

**Snowbreak, *n.*** 1. The breaking of trees by snow.

G., Schneebruch. F., bris de neige.

2. An area on which trees have been broken by snow.

3. *See* Shelterbelt.

**Soil, *n.*** In forest description the origin, composition, depth, and moisture of the forest soil are considered under soil. Its depth is defined by the following terms, each of which has its equivalent in inches:

Very shallow	=less than 6 inches.
Shallow	=6 to 12 inches.
Moderate	=12 to 24 inches.
Deep	=24 to 36 inches.
Very deep	=over 36 inches.

The moisture of the soil is defined by the following terms:

*Wet*: when water drips from a piece held in the hand without pressing.

*Moist*: when water drips from a piece pressed in the hand.

*Fresh*: when no water drips from a piece pressed in the hand, though it is unmistakably present.

*Dry*: when there is little or no trace of water.

*Very dry*: when the soil is parched. Such soils are usually caked and very hard, sand being an exception.

**Sour humus.** Humus harmful to forest growth owing to the presence of humic or similar acids produced by decomposition under excess of moisture and lack of air.

Syn.: acid humus. Ant.: mild humus. G., saurer Humus. F., humus tourbeux.

**Sown forest.** See Forest plantation.

**Sprout, *n.*** A tree which has grown from a stump or root.

Syn.: coppice shoot, root sucker, stool shoot, stump shoot. G., Stockausschlag. F., rejet de souche.

A *shoot* is a sprout which has not reached a height of 3 feet. See Tree class.

**Sprout forest.** A forest consisting wholly or mainly of sprouts.

Syn.: coppice, coppice forest. G., Niederwald. F., taillis.

**Sprout method.** That method of conservative lumbering in which reproduction is obtained by sprouts. See Forest management.

Syn.: coppice method or system. G., Niederwaldbetrieb. F., régime du taillis simple.

**Sprout system.** One of the three great systems of forest management, in which reproduction is secured by sprouts. See Forest management.

Syn.: coppice system. G., Stockausschlagbetrieb, Niederwaldbetrieb. F., régime du taillis simple.

**Square planting.** A method of planting in which the distance between the rows is equal to the distance between the young trees in the rows.

G., Quadratpflanzung. F., plantation en carré.

**Stagheaded, *a.*** See Dry topped.

**Stand, *n.*** All growing trees in a forest or in part of a forest.

Syn.: growing stock. G., Bestand. F., peuplement.

**Standard, *n.*** A tree from 1 to 2 feet in diameter breasthigh. See Tree class.

**Standard coppice.** See Reserve sprout forest.

**Standard coppice system.** See Reserve sprout method.

**Standard-forest, *n.*** A forest of standards. G., Baumholz. F., futaie, haute futaie.

**Stand class.** All stands of similar density, height, and volume for a given age or diameter and a given locality class. The index stand may constitute the first stand class.

G., Bestandesgüte. F., qualité du peuplement.

**Stand fire.** See Forest fire.

**Stand method.** That method of conservative lumbering in which reproduction is secured from self-sown seed by means of successive cuttings made throughout the mature stand, thus leading to the production of a new stand approximately even aged. These successive cuttings encourage seed production, create conditions favorable to the growth of seedlings, and gradually remove the remaining trees of the mature stand as the young growth develops. *See* Forest management.

Syn.: compartment system, high forest compartment system, method of successive thinnings, shelterwood compartment system. G., schlagweise Verjüngung. F., régime de la futaie régulière.

The series of cuttings, which vary in number and duration according to the degree of difficulty with which reproduction is effected, is divided into the following four kinds:

*Preparatory cuttings* fit the stand for its reproduction by the removal of dead, dying, or defective trees, and prepare the ground for the germination of seeds.

G., Vorbereitungsschlag. F., coupe préparatoire.

A stand in which one or more preparatory cuttings have been made is in the *preparatory stage*.

*Seed cuttings* encourage seed production by the further opening of the stand, and admit light in quantity favorable for the development of young growth.

G., Besamungsschlag. F., coupe d'ensemencement.

A stand in which one or more seed cuttings have been made is in the *seeding stage*.

*Removal cuttings* gradually remove the mature stand which would otherwise retard the development of the young trees.

G., Lichtschlag. F., coupe claire.

A stand in which one or more removal cuttings have been made is in the *removal stage*.

The *final cutting* is the last of the removal cuttings, in which all of the old stand still remaining is cut.

G., Abtriebsschlag, Endhieb. F., coupe définitive.

**Stand table.** A tabular statement of the number of trees of each species and diameter class upon a given area.

**State forest.** A forest which is the property of a State.

**Stem, n.** The trunk of a tree. The stem may extend to the top of the tree, as in some conifers, or it may be lost in the ramification of the crown, as in most broad-leaf trees. In tree description the stem is described as long or short, straight or crooked, cylindrical or tapering, smooth or knotty.

Syn.: bole, shaft, trunk. G., Stamm. F., tronc.

**Stem analysis.** *See* Tree analysis.

**Stem density.** The extent to which the total number of trees in a given forest approaches the total number which the index forest of the same age and composition contains. It is ordinarily expressed as a decimal, 1 being taken as the numerical equivalent of the stem density of the index forest.

G., Bestockungsdichte, Bestandesdichte. F., consistance du peuplement.

**Stem form factor.** *See* Form factor.

**Stool, n.** *See* Stump.

**Stool shoot.** *See* Sprout.

**Stored coppice.** *See* Reserve sprout forest.

**Stratify, v.** To preserve tree seeds by spreading them in layers alternating with layers of earth or sand.

**Strip method.** That method of conservative lumbering in which reproduction is secured on clean-cut strips by self-sown seed from the adjoining forest. *See* Forest management.

G., Conlissenhieb. F., coupe par bandes alternes.

**Strip stand method.** A modification of the stand method in which reproduction cuttings are not made simultaneously throughout the stand, but the stand is treated in narrow strips at such intervals that reproduction cuttings are generally going on in three strips at one time, one strip being in the removal stage, one in the seedling stage, and one in the preparatory stage. *See* Forest management.

**Strip survey.** *See* Valuation survey.

**Stub, *n.*** That portion of the stem left standing when a tree is accidentally broken off.

**Stump, *n.*** That portion of the stem below the cut made in felling a tree.

Syn.: stool. G., Stock. F., souche.

**Stump age.** The age of a tree as determined by the number of annual rings upon the face of the stump, without allowance for the period required for the growth of the tree to the height of the stump.

**Stump analysis.** *See* Tree analysis.

**Stump height.** The distance from the ground to the top of the stump, or from the root collar when the ground level has been disturbed. On a slope the average distance is taken as the stump height. *See* Cutting height.

**Stump shoot.** *See* Sprout.

**Subcompartment, *n.*** *See* Compartment.

**Sun scald.** An injury to the cambium caused by sudden exposure of a tree to strong sunlight.

Syn.: scald. G., Sonnenbrand. F., brûlure, coups de soleil.

**Suppressed, *a.*** Having growth more or less seriously retarded by shade. *See* Crown class.

G., unterdrückt. F., dominé.

**Surface fire.** *See* Forest fire.

**Sustained working.** *See* Working.

**Sustained yield.** *See* Working.

**System of high forest with standards.** *See* Reserve seed method.

**Technical rotation.** *See* Rotation.

**Thicket, *n.*** A stand of saplings.

G., Dickicht. F., fourré.

**Thin, *n.*** *See* Crown density.

**Thinning, *n.*** The removal of a portion of the trees with the object of improving the stand without inviting natural reproduction. The following kinds of thinning are distinguished: *cleaning, improvement thinning, accretion thinning.*

G., Durchforstung. F., coupe d'éclaircie.

**Timber form factor.** *See* Form factor.

**Timberland, *n.*** *See* Forest.

**Timber tract.** *See* Forest.

**Tolerance, *n.*** The capacity of a tree to endure shade.



**Tolerant, *a.*** Capable of enduring more or less heavy shade.

Syn.: shade-bearing, shade-enduring. G., Schattenetragend. F., à tempérament délicat.

**Total increment.** The total volume of wood produced by the growth of a tree or stand up to the time it is cut.

**Town forest.** A forest which is the property of a city, town, or village.

Syn.: communal forest. G., Gemeindewald. F., forêt communale.

**Transplant, *v.*** 1. To take up a young tree and set it out again in another place.

2. To transfer seedlings from the seedbed to another place in the forest nursery, or from the latter to the planting site.

G., verpflanzen, verschulen. F., transplanter.

**Transplant, *n.*** A seedling which has been transplanted once or several times.

G., Schulpflanze. F., plant repiqué.

**Trap tree.** A tree deadened or felled at a time when destructive bark beetles will be attracted to it and enter the bark. After they have entered, the bark is peeled and exposed to the sun, burned, or buried, as the case may require, to destroy the insect.

G., Fangbaum. F., arbre-piège.

**Tree analysis.** A series of measurements and observations upon a felled tree to determine its growth and life history.

Syn.: stem analysis. G., Stammanalyse. F., analyse de tige.

Tree analyses vary with their purpose, and may include all or a part of the following, or may require additions to meet special needs. The usual measurements comprise the length of each section, the diameter inside and outside the bark, the total age, the age and width of the sapwood, the diameter growth at given periods on the upper end of each section, the diameter breasthigh, the total height, and the clear, used, and merchantable lengths. The observations determine the class, form, and condition of the tree.

Although a tree analysis may include many combinations of the above measurements, two important classes are distinguished:

A *stump analysis* includes measurements of the diameter growth at given periods upon the stump only, no matter what other measurements it may comprise.

A *section analysis* includes measurements of the diameter growth at given periods upon more than one section.

When, in a stump or section analysis, the measurement of the diameter growth at given periods covers only a portion of the total diameter growth, the analysis is a *partial stump analysis* or a *partial section analysis*.

**Tree class.** All trees of approximately the same size. The following tree classes are distinguished: *seedling, shoot, small sapling, large sapling, small pole, large pole, stand-ard, veteran*.

**Tree form factor.** See Form factor.

**Tree scribe.** See Scratcher.

**Trench planting.** A method of planting on dry ground, in which the seeds of young trees are set in pits or trenches.

Syn.: pit planting.

**Triangular planting.** A method of planting in which the unit of arrangement is an equilateral triangle, at each apex of which young trees are placed.

G., Dreieckverband. F., plantation en triangle.

**Trunk, *n.*** See Stem.

**Two-storied forest.** Comprising on the same area two classes, which vary considerably in height, composed of trees of different species. The term is not applicable to forest under reproduction, in which the appearance of two stories is the temporary result of an incomplete process, but to those forests of which the two stories of growth are a natural and permanent feature.

G., zweihiebig. F., à double étage.

In a two-storied forest the taller trees form the *overwood*, or *upper story*. G., Oberholz, Oberstand. F., étage supérieur du peuplement. The shorter trees form the *underwood*, or *lower story*. G., Unterholz, Unterstand. F., sousétage.

**Underbrush, *n.*** All large, woody plants, such as witch-hobble, laurel, striped maple, and devil's club, which grow in a forest, but do not make trees. *See* Ground cover.

**Undergrowth, *n.*** The ground cover, underbrush, and young trees below the large sapling stage.

**Underplant, *v.*** To plant young trees under an existing stand.

**Underwood, *n.*** *See* two-storied forest.

**Uneven-aged forest.** *See* Irregular forest.

**Upper story.** *See* Two-storied forest.

**Used length.** The sum of the lengths of logs cut from a tree.

Syn.: actual merchantable length.

**Used volume.** The sum of the volumes of logs cut from a tree.

Syn.: actual merchantable volume.

**Valuation area.** A forest area of known size upon which measurements or other detailed studies are made for the determination of the stand or yield. *See* Experiment area.

Syn.: sample area, sample plot. G., Probefläche, Versuchsfläche. F., surface d'expérience, place d'essai.

**Valuation survey.** The measurement or other detailed study of the stand upon a valuation or experiment area.

Two kinds of valuation survey are distinguished:

1. The *strip survey* comprises the measurement of a stand, or a given portion of it, upon strips usually 1 chain wide.
2. The *plot survey* comprises the measurement of the stand, or a given portion of it, upon isolated plots not in the form of strips.

**Veteran, *n.*** A tree over 2 feet in diameter breasthigh. *See* Tree class.

**Veteran forest.** A forest of veterans.

G., Altholz. F., vieille futaie.

**Virgin forest.** *See* First growth.

**Volume growth.** *See* Increment.

**Volume increment.** *See* Increment.

**Volume rotation.** *See* Rotation.

**Volume table.** A tabular statement of the volume of trees in board feet or other units upon the basis of their diameter breasthigh, their diameter breasthigh and height, their age, or their age and height.

G., Massentafel. F., tarif de cubage.

**Volunteer growth.** Young trees which have sprung up in the open, as white pine in old fields, or cherry and aspen in burns. *See* Advance growth.

Syn.: old-field growth.

**Weed tree.** A tree of a species which has little or no value.

G., Unholz. F., morts-bois.

**Windbreak, n.** 1. The breaking of trees by wind.

2. *See* Shelterbelt.

3. *See* Windfall.

**Windfall.** 1. A tree thrown by wind.

2. An area on which the trees have been thrown by wind.

Syn. windbreak. G., Windbruch. F., volis.

**Wind-firm, a.** Able to withstand heavy wind.

G., sturmfest, windfest. F., resistant au vent.

**Wind mantle.** *See* Shelterbelt.

**Woodland, n.** *See* Forest.

**Woodlot, n.** *See* Forest.

**Work, v.** To harvest the final yield under a working plan.

**Working, n.** The harvesting of the final yield under a working plan.

G., Betrieb. F., exploitation.

Working is *annual* when cuttings are made each year; *periodic* when they are made after uniform periods of two or more years; and *intermittent* when they are made at irregular intervals. *Sustained* annual, periodic, or intermittent workings are those under which the amount of wood cut is so regulated that the productive capacity of the forest does not decrease, but produces a *sustained yield* (G., Nachhaltsbetrieb. F., exploitation à rendement soutenu), which likewise may be annual, periodic, or intermittent.

**Working area.** The total forest area managed under a working plan.

Syn.: working circle. G., Wirtschaftseinheit. F., unité d'exploitation.

**Working circle.** *See* Working area.

**Working plan.** A detailed and comprehensive scheme for the best permanent use of a forest.

G., Wirtschaftsplan. F., plan d'exploitation.

**Working plan renewal.** The preparation of a new working plan for a given tract, when the present working plan has been carried out, or changed conditions require its revision.

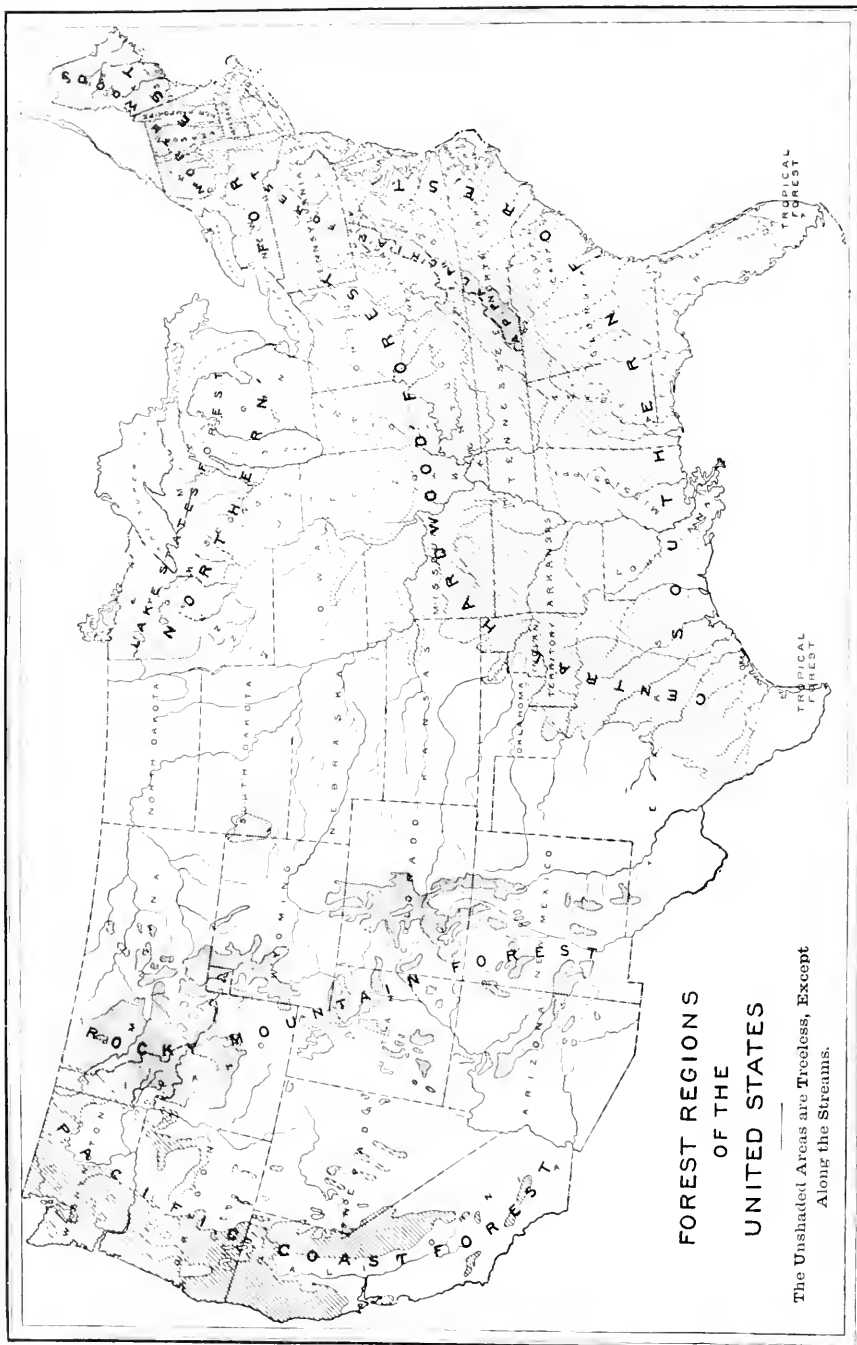
**Yield, n.** The amount of wood at present upon, or which after a given period will be upon, a given area. *See* Present yield; Future yield; Accident yield; Intermediate yield; Final yield; Working.

G., Ertrag. F., rendement.

**Yield table.** *See* Present yield table; Future yield table.







# FOREST REGIONS OF THE UNITED STATES

The Unshaded Areas are Treeless, Except  
Along the Streams.

## LOGGING TERMS.

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[Letters in parentheses following definitions indicate the forest regions (see map) in which the terms as defined are used.

(Gen.)=General=In all forest regions of the United States.

(C. H. F.)=Central Hardwood Forest.

(N. F.)=Northern Forest.

(App.)=Appalachian Forest.

(L. S.)=Lake States Forest.

(N. W.)=North Woods.

(S. F.)=Southern Forest.

(R. M. F.)=Rocky Mountain Forest.

(P. C. F.)=Pacific Coast Forest.

In a few instances very local terms are ascribed to a State instead of to a forest region.]

**Alder grab.** The stem of an alder, or other small tree, which is bent over and plugged into a hole bored in a boom stick, or secured in some other way, to hold a boom or logs inshore. (N. F.)

**Alligator, n.** 1. A boat used in handling floating logs. It can be moved overland from one body of water to another by its own power, usually applied through drum and cable. (N. W., L. S.)

2. A device, often made from the fork of a tree, on which the front end of a log is placed to facilitate skidding on swampy ground. (S. F.)

**Anchor line.** A line attached to a small buoy and to one fluke of an anchor used in towing a raft of logs. It is employed to free the anchor when fast to rocks or snags. (N. F.)

**Apron, n.** 1. A platform projecting downstream from the sluiceway of a dam to launch well into the stream logs which pass through the sluiceway. (Gen.)

2. A platform built of timbers at the foot of a slide, which guides in the desired direction logs leaving the slide. (Gen.)

**Ark, n.** See Wanigan.

**Back line.** See Haul back.

**Ballhooter, n.** One who rolls logs down a hillside. (App.)

**Bank, v.** See Bank up, to.

**Bank, n.** 1. See Landing.

2. The logs cut or skidded in one day above the required amount and held over by the saw crew or skidders, to be reported when the required daily number is not reached. (N. F.)

**Banking ground.** See Landing.

**Bank up, to.** To pile up logs on a landing. (Gen.)

Syn.: bank.

**Barker, n.** One who peels bark in gathering tanbark. (Gen.)

Syn.: peeler, spudder.

**Barking iron.** See Spud.

- Bark mark.** A symbol chopped into the side of a log to indicate its ownership; when used with the end mark it serves as an additional means of identification. (Gen.) *See* Mark.  
Syn.: side mark. (N. F.)
- Bark marker.** One who cuts the bark mark on logs. (Gen.)
- Barn boss.** One who has charge of the stables in a logging camp. (Gen.)  
Syn.: feeder. (N. W.)
- Batten, *n.*** A log less than 11 inches in diameter at the small end. (Maine.)
- Battery, *n.*** Two or more donkey engines for dragging logs, set at intervals on a long skid road. (P. C. F.)
- Beaver, *n.*** *See* Swamper.
- Becket, *n.*** A large hook used in loading logs on cars by means of tackle. (P. C. F.)
- Bed a tree, *to.*** To level up the path in which a tree is to fall, so that it may not be shattered. (P. C. F.)
- Bicycle, *n.*** A traveling block, used on a cable in steam skidding. (S. F.)
- Bigness scale.** *See* Full scale.
- Big Wheels.** *See* Logging wheels.
- Binder, *n.*** A springy pole used to tighten a binding chain. (Gen.)  
Syn.: jim binder.
- Binding chain.** A chain used to bind together a load of logs. (Gen.)  
Syn.: wrapper chain. (N. F.)
- Binding logs.** Logs placed on the top of the chain binding a load, in order to take up the slack. (Gen.)
- Birl, *v.*** To cause a floating log to rotate rapidly by treading upon it. (Gen.)
- Bitch chain.** A short, heavy chain with hook and ring, used to fasten the lower end of a gin pole to a sled or car when loading logs. (N. F.)
- Blaze, *v.*** To mark, by cutting into trees, the course of a boundary, road, trail, or the like. (Gen.)  
Syn.: spot. (N. W.)
- Block, *n.*** *See* Brail.
- Blow down.** *See* Windfall.
- Blue jay.** *See* Road monkey.
- Bluing, *n.*** The result of fungus attack, which turns the sapwood of certain trees blue. (Gen.)
- Bob, *n.*** *See* Dray.
- Bobber, *n.*** *See* Deadhead.
- Bob logs, *to.*** To transport logs on a bob or dray. (N. F.)
- Body wood.** Cord wood cut from those portions of the stems of trees which are clear of branches. (N. F.)
- Bolster, *n.*** *See* Bunk.
- Boom, *n.*** Logs or timbers fastened together end to end and used to hold floating logs. The term sometimes includes the logs inclosed, as a boom of logs. (Gen.)
- Boomage, *n.*** Toll for use of a boom. (Gen.)
- Boom buoy.** *See* Boom stay.
- Boom chain.** A short chain which fastens boom sticks end to end. (Gen.)
- Boom company.** A corporation engaged in handling floating logs, and owning booms and booming privileges. (N. F.)



**Boom pin.** A wooden plug used to fasten to boom sticks the chain, rope, or withe which holds them together. (Gen.)

**Boom rat.** One who works on a boom. (N. F.)

**Boom stay.** A heavy weight used to anchor booms in deep water; its position is indicated by a pole or float attached to it. (N. F.)

Syn.: boom buoy.

**Boom stick.** A timber which forms part of a boom. (Gen.)

**Bottle butted.** *See* Swell butted.

**Bottom sill.** *See* Mudsill.

**Brail, v.** To fasten logs in brails.

**Brail, n.** A section of a log raft, six of which make an average tow. (L. S.)

Syn.: block. (S. F.)

**Brake sled.** A logging sled so constructed that, when the pole team holds back, a heavy iron on the side of each runner of the forward sled is forced into the roadbed. (N. F.)

**Brand, n.** *See* Mark.

**Break out, to.** 1. To start a sled whose runners are frozen to the ground. (N. W., L. S.)

2. To open a logging road after heavy snowfall. (N. W., L. S.)

**Breastwork log.** *See* Fender skid.

**Briar, n.** A crosscut saw. (Gen.)

**Bridle, n.** A device for controlling the speed of logs on a skid road. It consists of a short rope with two hooks at one end, which are driven into the first log of the turn; at the other end is a clamp which runs over the cable. (P. C. F.)

**Bridle man.** One who follows a turn of logs down the skid road and tends the "bridle." (P. C. F.)

**Broadleaf, n.** *See* Hardwood.

**Brow skid.** The chief beam in a frame to which tackle for loading logs on cars is fastened. (P. C. F.)

Syn.: draw skid, lead log.

**Brush a road, to.** To cover with brush the mudholes and swampy places in a logging road, to make it solid. (N. F.)

**Brush snow fence.** A snowbreak to protect a logging road; used most commonly on wide marshes. It consists of brush which is set upright in the ground before it freezes. (N. F.)

**Brutting crew.** A crew which rolls logs down slopes too steep for teams. (App.)

**Buck, v.** 1. To saw felled trees into logs. (P. C. F.)

2. To bring or carry, as to buck water or wood. (Gen.)

**Bucker, n.** 1. One who saws felled trees into logs. (P. C. F.) Syn.: cross cutter.

2. One who brings or carries. *See* Buck.

**Buckwheat, v.** *See* Hang up, to.

**Buckwheater, n.** A novice at lumbering. (Gen.)

**Bull chain.** 1. A very heavy chain, to which a number of short chains, with hooks on one end and dogs on the other, are attached. It is used to draw logs from the mill pond up the gangway. (Gen.)

2. *See* Jack chain.

**Bull cook.** *See* Chore boy.

- Bull donkey.** A large donkey engine which, by drum and cable, drags logs from the place where they are yarded to a landing. (P. C. F.)
- Bully, n.** A common name for the foreman or boss of a logging camp. (N. F.)
- Bummer, n.** A small truck with two low wheels and a long pole, used in skidding logs. (N. F., S. F.)  
Syn.: drag cart, skidder.
- Bunch load, to.** To encircle several logs with a chain and load them at once, by steam or horsepower. (N. F.)
- Bunch logs, to.** To collect logs in one place for loading. (Gen.)
- Bunk, v.** To place upon the bunks, as to "bunk a log." (Gen.)
- Bunk, n.** 1. The heavy timber upon which the logs rest on a logging sled. (N. F.)  
Syn.: bolster.  
2. The cross beam on a log car or truck, on which the logs rest. (Gen.)  
3. A log car or truck. (S. F., P. C. F.)
- Bunk chain.** See Toggle chain.
- Bunk hook.** The hook attached to the end of the bunk on a logging car, which may be raised to hold the logs in place or lowered to release them. (Gen.)
- Bunk load.** A load of logs not over one log deep; i. e., in which every log rests on the bunks. (Gen.)
- Bunk spikes.** Sharp spikes set upright in the bunks of a logging sled to hold the logs in place. (N. F.)
- Bush a road, to.** To mark the route of a logging road across a marsh or the ice by setting up bushes. (N. F.)
- Butt, n.** The base of a tree, or the big end of a log. (Gen.)
- Butt cut, 1.** The first log above the stump. (Gen.)  
Syn.: butt log. (Gen.)  
2. In gathering tailbark, the section of bark taken from the butt of a tree before felling it for further peeling. (N. F.)
- Butt hook.** The hook by which the cable is attached to the tackle on the logs. (P. C. F.)
- Butt log.** See Butt cut.
- Butt off, to, 1.** To cut a piece from the end of a log on account of a defect. (Gen.)  
Syn.: long butt, to. (P. C. F., App.)  
2. To square the end of a log. (N. F.)
- Buttress, n.** A wall or abutment built along a stream to prevent the logs in a drive from cutting the bank or jamming. (Gen.)
- Butt team.** In a logging team of four or more, the pair nearest the load. (Gen.)
- Camp inspector.** A lazy lumberjack, who goes from one logging camp to another, working only a short time in each. (N. F.)
- Cannon a log, to.** In loading logs by steam or horse power, to send up a log so that it swings crosswise, instead of parallel to the load. (N. F.)
- Cant dog.** See Cant hook.
- Cant hook.** A tool like a peavey, but having a toe ring and lip at the end instead of a pike. See Peavey. (Gen.)  
Syn.: cant dog.
- Cap, n.** A cone of sheet iron or steel, with a hole in the end through which a chain passes, which is fitted over the end of a log before snaking it, to prevent catching on stumps, roots, or other obstacles, in steam skidding. (S. F.)

- Catamaran, n.** A small raft carrying a windlass and grapple, used to recover sunken logs. (Gen.)  
 Syn.: sinker boat (Gen.), monitor, pontoon (P. C. F.).
- Catch boom.** A boom fastened across stream to catch and hold floating logs. (Gen.)
- Catface, n.** A partly healed over fire scar on the stem of a tree. (P. C. F.)
- Catpiece, n.** A small stick in which holes are made at regular intervals, placed on the top of uprights firmly set in floating booms. The uprights are fitted to enter the holes in the catpiece, so as to narrow or widen the space between the booms at the entrance to a sluiceway or sorting jack. The catpiece is held by the uprights high enough above water to allow logs to float freely under it. (N. W., L. S.)
- Cattyman, n.** An expert river driver. (N. F.)
- Center jam.** A jam formed on an obstacle in the middle of a stream, and which does not reach either shore. (Gen.)  
 Syn.: stream jam.
- Chain grapples.** *See* Grapples.
- Chain tender.** *See* Sled tender.
- Check, n.** A longitudinal crack in timber caused by too rapid seasoning. (Gen.)  
 Syn.: season check.
- Cheese block.** *See* Chock block.
- Chock block.** A small wedge or block used to prevent a log from rolling. (Gen.)  
 Syn.: cheese block. (P. C. F.)
- Choker, n.** A noose of wire rope by which a log is dragged. (P. C. F.)
- Choker man.** The member of a yarding crew who fastens the choker on the logs. (P. C. F.)
- Chopper, n.** *See* Faller.
- Chore boy.** One who cleans up the sleeping quarters and stable in a logging camp, cuts firewood, builds fires, and carries water. (Gen.)  
 Syn.: bull cook, flunkey, shanty boss.
- Chunk, v.** To clear the ground, with engine or horses, of obstructions which can not be removed by hand. (P. C. F.)
- Chunk up, to.** To collect and pile for burning the slash left after logging. (N. W., L. S.)
- Churn butted.** *See* Swell butted.
- Chute, n.** *See* Slide.
- Coal off, to.** To cut a forest clean for charcoal wood. (N. F.)
- Commissary, n.** A general store for supplying lumbermen. (App., S. F.) *See* Van.
- Conk, n.** 1. The decay in the wood of trees caused by a fungus. (N. F., P. C. F.)  
 2. The visible fruiting organ of a tree fungus. (N. F., P. C. F.)
- Conky, a.** Affected by conk. (N. F., P. C. F.)
- Cook camp.** The building used as kitchen and dining room in a logging camp. (Gen.)  
 Syn.: cook house, cook shanty.
- Cooke, n.** Assistant cook and dishwasher in a logging camp. (Gen.)
- Cook house.** *See* Cook camp.
- Cook shanty.** *See* Cook camp.
- Corkscrew, n.** A geared logging locomotive. (P. C. F.)  
 Syn.: stem-winder. (App.)

- Corner binds.** Four stout chains, used on logging sleds, to bind the two outside logs of the lower tier to the bunks, and thus give a firm bottom to the load. (N. F.)
- Corner man.** In building a camp or barn of logs, one who notches the logs so that they will fit closely and make a square corner. (N. F.)
- Coupling grab.** *See* Grapples.
- Crab, n.** A small raft bearing a windlass and anchor, used to move log rafts upstream or across a lake. (N. F., S. F.)
- Cradle, n.** A framework of timbers in which ocean-going rafts of logs are built. (P. C. F.)
- Cradle knolls.** Small knolls which require grading in the construction of logging roads. (N. W., L. S.)
- Crazy chain.** The short chain used to hold up that tongue of a sprinkler sled which is not in use. (N. F.)
- Crib, n.** Specifically, a raft of logs; loosely applied to a boom of logs. (N. F.)
- Crib logs, to.** To surround floating logs with a boom and draw them by a windlass on a raft (a *crab*), or to tow them with a steamboat. (N. W., L. S.)
- Cross chains.** Chains connecting the front and rear sleds of a logging sled. (N. F.)
- Cross cutter.** *See* Bucker.
- Cross haul.** The cleared space in which a team moves in cross hauling. (N. F.)
- Cross haul, to.** To load cars or sleds with logs by horsepower and crotch or loading chain. (Gen.)
- Crotch, v.** To cut notches on opposite sides of a log near the end, into which dogs are fastened. (P. C. F.)
- Crotch, n.** *See* Dray.
- Crotch chain.** A tackle for loading logs on sleds, cars, or skidways by cross hauling. (Gen.)
- Crotch tongue.** Two pieces of wood, in the form of a V, joining the front and rear sleds of a logging sled. (N. W., L. S.)
- Cruise, v.** To estimate the amount and value of standing timber. (Gen.)  
Syn.: estimate, value.
- Cruiser, n.** One who cruises. (Gen.)  
Syn.: estimator, land looker, valuer.
- Cull, n.** Logs which are rejected, or parts of logs deducted in measurement on account of defects. (Gen.)
- Cut, n.** A season's output of logs. (Gen.)
- Cut a log, to.** To move one end of a log forward or backward, so that the log will roll in the desired direction. (Gen.)
- Cut off.** An artificial channel by which the course of a stream is straightened, to facilitate log driving. (N. F.)
- Deacon seat.** The bench in front of the sleeping bunks in a logging camp. (N. F.)
- Deadener, n.** A heavy log or timber, with spikes set in the butt end, so fastened in a log slide that the logs passing under it come in contact with the spikes and have their speed retarded. (Gen.)
- Deadhead, n.** A sunken or partly sunken log. (Gen.)  
Syn.: sinker (Gen.), bobber (N. F.).
- Deadman, n.** A fallen tree on the shore, or a timber to which the hawser of a boom is attached. (N. F., P. C. F.)
- Deadwater.** *See* Stillwater.

**Decker, n.** One who rolls logs upon a skidway or log deck. (Gen.)

**Decking chain.** See Loading chain.

**Deck up, to.** To pile logs upon a skidway. (Gen.)

**Deer foot.** A V-shaped iron catch on the side of a logging car, in which the binding chain is fastened. (Gen.)

**Dehorn, v.** To saw off the ends of logs bearing the owner's mark and put on a new mark. (Kentucky.)

**Dingle, n.** The roofed-over space between the kitchen and the sleeping quarters in a logging camp, commonly used as a storeroom. (N. W., L. S.)

**Dinky, n.** A small logging locomotive. (App., S. F.)

**Dog, n.** A short, heavy piece of steel, bent and pointed at one end and with an eye or ring at the other. It is used for many purposes in logging, and is sometimes so shaped that a blow directly against the line of draft will loosen it. (Gen.)  
Syn.: tail hook. (P. C. F.)

**Dog boat.** See Rigging sled.

**Dogger, n.** One who attaches the dogs or hooks to a log before it is steam skidded. (S. F.; P. C. F.)

**Dog hook.** 1. The strong hook on the end of a dogwarp. (N. F.)

2. A hook on the end of a haul-up chain of a size to permit its being hooked into a link of the chain when the latter is looped around a log or other object. (P. C. F.)

**Dogs, n.** See Skidding tongs.

**Dogwarp, n.** A rope with a strong hook on the end, which is used in breaking dangerous jams on falls and rapids and in moving logs from other difficult positions. (N. F.)

**Dog wedge.** An iron wedge with a ring in the butt, which is driven into the end of a log and a chain hitched in the ring for skidding the log by horsepower; also used in gathering up logs on a drive by running a rope through the rings and pulling a number of logs at a time through marshes or partially submerged meadows to the channel. (N. F.)

**Dolly, n.** See Upright roller.

**Dolphin, n.** A cluster of piles to which a boom is secured. (P. C. F.)

**Donkey, n.** A portable steam engine, equipped with drum and cable, used in steam logging. See Road donkey; Yarding donkey; Bull donkey; Spool donkey. (P. C. F.)

**Donkey sled.** The heavy sled-like frame upon which a donkey engine is fastened. (P. C. F.)

**Dote, n.** The general term used by lumbermen to denote decay or rot in timber. (Gen.)

**Doty, a.** Decayed. (Gen.)

Syn.: dozy.

**Double couplers.** Two coupling grabs joined by a short cable, used for fastening logs together. (P. C. F.)

Syn.: four paws.

**Double header.** A place from which it is possible to haul a full load of logs to the landing, and where partial loads are topped out or finished to the full hauling capacity of teams. (N. W., L. S.)

**Down-hill clevis.** A brake on a logging sled, consisting of a clevis encircling the runner, to the bottom of which a heavy square piece of iron is welded. (N. F.)

**Dozy, a.** See Doty.

**Drag cart.** *See* Bummer.

**Drag in, to.** *See* Dray in, to.

**Drag road.** *See* Dray road; Gutter road.

**Drag sled.** *See* Dray.

**Draw hook.** *See* Gooseneck.

**Draw skid.** *See* Brow skid.

**Dray, n.** A single sled used in dragging logs. One end of the log rests upon the sled. (N. F.)

Syn.: hob, crotch, drag sled, go-devil, lizard, scoot, skidding sled, sloop, travois.

**Dray in, to.** To drag logs from the place where they are cut directly to the skid-way or landing. (N. F.)

Syn.: drag in, to.

**Dray road.** A narrow road, cut wide enough to allow the passage of a team and dray. (N. F.)

Syn.: drag road.

**Drive, v.** To float logs or timbers from the forest to the mill or shipping point. (Gen.)

Syn.: float.

**Drive, n.** 1. A body of logs or timbers in process of being floated from the forest to the mill or shipping point. (Gen.)

2. That part of logging which consists in floating logs or timbers. (Gen.)

**Drum logs, to.** To haul logs by drum and cable out of a hollow or cove. (App.)

**Dry-ki, n.** Trees killed by flooding. (N. F.)

**Dry pick, to.** As applied to a jam, to remove logs singly while the water is cut off. (N. F.)

**Dry roll, to.** In sacking the rear, to roll stranded logs into the bed of the stream from which the water has been cut off preparatory to flooding. (N. F.)

**Dry rot.** Decay in timber without apparent moisture. (Gen.)

**Dry slide.** *See* Slide.

**Dry sloop, to.** To sloop logs on bare ground when the slope is so steep that it would be dangerous to sloop on snow. (N. F.)

**Dudler, n.** *See* Dudley.

**Dudley, n.** An engine for hauling logs, which propels itself and drags its load by revolving a large spool around which are several turns of a cable fixed at each end of the track. (P. C. F.)

Syn.: dudler.

**Duffle, n.** The personal belongings of a woodsman or lumberjack which he takes into the woods. (Gen.)

Syn.: dunnage. (N. W.)

**Dump hook.** A levered chain grab hook attached to the eyener to which a team is hitched in loading logs. A movement of the lever releases the hook from the logging chain without stopping the team. (N. F.)

**Dump logs, to.** To roll logs over a bluff, or from a logging car or sled into the water. (Gen.)

**Dunnage, n.** *See* Duffle.

**Dust a dam, to.** To fill up with earth or gravel the cracks or small holes between planks in the gate of a splash dam. (N. W.)

**Dutchman, n.** A short stick placed transversely between the outer logs of a load to divert the load toward the middle and so keep any logs from falling off. (N. F.)

**End mark.** *See* Mark.

**Estimate, v.** *See* Cruise.

**Estimator, n.** *See* Cruiser.

**Face log.** *See* Head log.

**Faller, n.** One who fells trees. (Gen.) *See* Head faller; Second faller.

Syn.: sawyer (Gen.), chopper (App.).

**Falling ax.** An ax with a long helve and a long, narrow bit, designed especially for felling trees. (Gen.)

**Falling wedge.** A wedge used to throw a tree in the desired direction, by driving it into the saw kerf. (Gen.)

**Feeder, n.** *See* Barn boss.

**Fender boom.** *See* Shear boom.

**Fender skid.** A skid placed on the lower side of a skidding trail on a slope to hold the log on the trail while being skidded. (Gen.)

Syn.: breastwork log, glancer, shear skid.

**Fid hook.** A slender, flat hook used to keep another hook from slipping on a chain. (N. W., L. S.)

**Filer, n.** One who files the crosscut saws in the woods. (Gen.)

Syn.: saw fitter.

**Fitter, n.** 1. One who notches the tree for felling and after it is felled marks the log lengths into which it is to be cut. (N. F.)

2. One who cuts limbs from felled trees and rings and slits the bark preparatory to peeling tanbark. (N. F.)

**Float, v.** *See* Drive.

**Float road.** A channel cleared in a swamp and used to float cypress logs from the woods to the boom at the river or mill. (S. F.)

**Flood, v.** *See* Splash.

**Flood dam.** *See* Splash dam.

**Flume, v.** To transport logs or timbers by a flume. (Gen.)

Syn.: sluice.

**Flume, n.** An inclined trough in which water runs, used in transporting logs or timbers. (Gen.)

Syn.: sluice, water slide, wet slide.

**Flunkey, n.** 1. An assistant, usually either to the engineer of a donkey engine or to the cook in a logging camp. (P. C. F.)

2. *See* Chore boy.

**Flying drive.** A drive the main portion of which is put through with the utmost dispatch, without stopping to pick rear. (N. F.)

**Fly rollway.** A skidway or landing on a steep slope, from which the logs are released at once by removing the brace which holds them. (N. F.)

**Fore-and-aft road.** A skid road made of logs placed parallel to its direction, making the road resemble a chute. (P. C. F.)

Syn.: stringer road.

**Four paws.** *See* Double couplers.

**Frog, n.** 1. The junction of two branches of a flume. (P. C. F.)

2. A timber placed at the mouth of a slide to direct the discharge of the logs. (Gen.) Syn.: throw out.

**Full scale.** Measurement of logs, in which no reduction is made for defects. (Gen.)

Syn.: bigness scale. (N. F.)

**Gangway, *n.*** The incline plane up which logs are moved from the water into a sawmill. (Gen.)

Syn.: jack ladder, log jack, log way, slip.

**Gap stick.** The pole placed across the entrance of a sorting jack to close it, when not in use. (Gen.)

**Ge throw.** A heavy, wooden lever, with a curved iron point, used to break out logging sleds. (N. F.)

Syn.: starting bar.

**Gin pole.** A pole secured by guy ropes, to the top of which tackle for loading logs is fastened. (Gen.)

**Glauzer, *n.*** See Fender skid.

**Glancing boom.** See Shear boom.

**Glisse skids.** Freshly peeled skids up which logs are slid instead of rolled when being loaded. (N. F.)

Syn.: slip skids.

**Go-back road.** A road upon which unloaded logging sleds can return to the skidways for reloading, without meeting the loaded sleds en route to the landing. (N. F.)

Syn.: short road.

**Go-devil.** See Dray.

**Gonseneck, *n.*** 1. A wooden bar used to couple two logging trucks. (Gen.)

Syn.: rooster. (P. C. F.)

2. The point of draft on a logging sled; it consists of a curved iron hook bolted to the roll. (N. F.)

Syn.: draw hook.

3. A curved iron driven into the bottom of a slide to check the speed of descending logs. (App.)

**Goosepen.** A large hole burned in a standing tree. (P. C. F.)

**Grab hook.** A hook having a narrow throat, adapted to grasp any link of a chain. (Gen.)

**Grab link.** See Slip grab.

**Grabs, *n.*** See Skidding tongs.

**Grab skipper.** A short iron pry or hammer, used to remove the skidding tongs from a log. (App., S. F.)

**Grapples, *n.*** 1. Two small iron dogs joined by a short chain, and used to couple logs end to end when skidding on mountains, so that several logs may be skidded by one horse at the same time. (N. F.)

Syn.: chain grapples, coupling grab. (P. C. F.)

2. See Skidding tongs.

**Gravel a dam, *to.*** To cover with gravel or earth the upstream side of the timber work of a dam, to make it water tight. (N. F.)

**Greaser, *n.*** See Road monkey.

**Grips, *n.*** See Skidding tongs.

**Ground loader.** See Send-up man.

**Grouser, *n.*** A large and long stick of squared timber sharpened at the lower end and placed in the bow of a steam logging boat; it takes the place of an anchor in shallow water, and can be raised or lowered by steam power. (N. W., L. S.)

**Guard a hill, *to.*** To keep a logging road on a steep decline in condition for use. (N. F.)



**Gun, *v.*** To aim a tree in felling it. In the case of very large, brittle trees, such as redwood, a sighting device (gunning stick) is used. (P. C. F.)

Syn.: point, swing. (Gen.)

**Gunning stick.** *See* Gun.

**Guttermen.** *See* Swamper.

**Gutter road.** The path followed in skidding logs. (Gen.)

Syn.: drag road, runway, skidding trail, snaking trail.

**Handbarrow.** Two strong, light poles held in position by rungs, upon which bark or wood is carried by two men. (N. W., L. S.)

Syn.: ranking bar.

**Hand pike.** A piked lever, usually 6 to 8 feet long, for handling floating logs. (Gen.)

**Hand skidder.** One who accompanies a log as it is being dragged and places short skids beneath it. (P. C. F.)

**Hang the boom, to.** To put the boom in place. (Gen.)

**Hang up, to.** 1. To fell a tree so that it catches against another instead of falling to the ground. (Gen.)

Syn.: lodge (Gen.), buckwheat (App.)

2. As applied to river driving, to discontinue; thus a drive may be "hung up" for lack of water or for some other reason.

**Hardwood, *a.*** As applied to trees and logs, broadleafed, belonging to the dicotyledons. (Gen.)

Syn.: broadleaf.

**Hardwood, *n.*** A broadleafed, or dicotyledonous, tree. (Gen.)

**Haul, *n.*** In logging, the distance and route over which teams must go between two given points, as between the yard or skidway and the landing. (Gen.)

**Haul back.** A small wire rope, traveling between the donkey engine and a pulley set near the logs to be dragged, used to return the cable. (P. C. F.)

Syn.: back line, pull back, trip line.

**Haul up.** A light chain and hook by which a horse may be hitched to a cable in order to move it where desired. (P. C. F.)

**Hay road.** *See* Tote road.

**Hay wire outfit.** A contemptuous term for loggers with poor logging equipment. (N. F.)

**Head block.** The log placed under the front end of the skids in a skidway to raise them to the desired height. (N. F.)

**Head driver.** An expert river driver who, during the drive, is stationed at a point where a jam is feared. Head drivers usually work in pairs. (N. F.)

Syn.: log watch (N. F.), jam cracker (P. C. F.)

**Head faller.** The chief of a crew of fallers. (P. C. F.)

**Head log.** 1. The front bottom log on a skidway. (N. F.)

Syn.: face log.

2. The front log in a turn. (P. C. F.)

Syn.: lead log.

**Head push.** *See* Straw boss.

**Headquarters, *n.*** In logging, the distributing point for supplies, equipment, and mail; not usually the executive or administrative center. (Gen.)

**Head tree.** In steam skidding, the tree to which the cable upon which the traveler runs is attached. (S. F.)

**Headworks, *n.*** A platform or raft, with windlass or capstan, which is attached to the front of a log raft or boom of logs, for warping, kedging, or winding it through lakes and still water, by hand or horse power. (N. W., L. S.)

**Helper, *n.*** *See* Second faller.

**Hoist, *n.*** *See* Loading tripod.

**Holding boom.** *See* Storage boom.

**Hook tender.** The foreman of a yarding crew; specifically, one who directs the attaching of the cable to a turn of logs. (P. C. F.)

**Horse dam.** A temporary dam made by placing large logs across a stream, in order to raise the water behind it, so as to float the rear. (N. F.)

**Horse logs, to.** In river driving, to drag stranded logs back to the stream by the use of peaveys. (N. F.)

**Hovel, *n.*** A stable for logging teams. (N. W., L. S.)

**Ice a road, to.** To sprinkle water on a logging road so that a coating of ice may form, thus facilitating the hauling of logs. (N. F.)

**Ice guards.** Heavy timbers fastened fan shaped about a cluster of boom piles at an angle of approximately 30 degrees to the surface of the water. They prevent the destruction of the boom by ice, through forcing it to mount the guards and be broken up. (N. F.)

**Jack chain.** An endless spiked chain, which moves logs from one point to another, usually from the mill pond into the sawmill. (Gen.)  
Syn.: bull chain. (P. C. F.)

**Jack ladder.** *See* Gangway.

**Jackpot, *n.*** 1. A contemptuous expression applied to an unskillful piece of work in logging. (N. F.)

2. An irregular pile of logs. (App.)

**Jam, *n.*** A stoppage or congestion of logs in a stream, due to an obstruction or to low water. (Gen.)

**Jam cracker.** *See* Head driver.

**Jammer, *n.*** An improved form of gin, mounted on a movable framework, and used to load logs on sleds and cars by horsepower. (N. F.)

**Jam, to break a.** To start in motion logs which have jammed. (Gen.)

**Jay hawk, to.** To strip one 4-foot length of bark from a tanbark oak, leaving the tree standing. (P. C. F.)

**Jiboo, *v.*** To remove a dog from a log. (N. W., L. S.)

**Jigger, *v.*** To pull a log by horsepower over a level place in a slide. (Gen.)  
Syn.: lazy haul, to.

**Jim binder.** *See* Binder.

**Jobber, *n.*** A logging contractor or subcontractor. (Gen.)

**Jobber's sun.** A term applied to the moon in a jobber's or contractor's logging camp, on account of the early and late hours of commencing and ending work. (N. W., L. S.)

**Junper, *n.*** A sled shod with wood, used for hauling supplies over bare ground into a logging camp. (N. F.)  
Syn.: tote sled.

**Katydid, *n.*** *See* Logging wheels.

**Key log.** In river driving, a log which is so caught or wedged that a jam is formed and held. (Gen.)

- Killig, n.** A short, stout pole used as a lever or brace to direct the fall of a tree. (N. W.)
- Knot, v.** *See* Limb.
- Knot bumper.** *See* Limber.
- Knotter, n.** *See* Limber.
- Laker, n.** A log driver expert at handling logs on lakes. (N. F.)
- Landing, n.** 1. A place to which logs are hauled or skidded preparatory to transportation by water or rail. A *rough and tumble landing* is one in which no attempt is made to pile the logs regularly. (Gen.)  
Syn.: bank, banking ground, log dump, rollway, yard.  
2. A platform, usually at the foot of a skid road, where logs are collected and loaded on cars. A *lightning landing* is one having such an incline that the logs may roll upon the cars without assistance. (Gen.)
- Landing man.** One who unloads logging sleds at the landing. (N. F.)
- Landing, to break a.** To roll a pile of logs from a landing or bank into the water. (Gen.)
- Land looker.** *See* Cruiser.
- Lap, n., or Lapwood, n.** Tops left in the woods in logging. (Gen.)
- Lash pole.** A cross pole which holds logs together in a raft. (Gen.)
- Lazy haul, to.** *See* Jigger.
- Lead, n.** A snatch block with a hook or loop for fastening it to convenient stationary objects, used for guiding the cable by which logs are dragged. (P. C. F.)
- Lead line.** A wire rope, with an eye at each end, used to anchor the snatch block in setting a lead. (P. C. F.)
- Lead log.** *See* Brow skid; Head log.
- Lightning landing.** *See* Landing.
- Limb, v.** To remove the limbs from a felled tree.  
Syn.: knot. (P. C. F.)
- Limber, n.** One who cuts the limbs from felled trees. (Gen.)  
Syn.: knotter (P. C. F.), knot bumper (App.).
- Line horse.** The horse which drags the cable from the yarding engine to the log to which the cable is to be attached. (P. C. F.)
- Lizard, n.** *See* Dray.
- Loader, n.** 1. One who loads logs on sleds or cars. (Gen.)  
2. *See* Steam loader.
- Loading chain.** A long chain used in loading or piling logs with horses. (N. F.)  
Syn.: decking chain.
- Loading jack.** A platformed framework upon which logs are hoisted from the water for loading upon cars. (N. F.)
- Loading tripod.** Three long timbers joined at their tops in the shape of a tripod, for holding a pulley block in proper position to load logs on cars from a lake or stream. (L. S.)  
Syn.: hoist.
- Lock down.** A strip of tough wood, with holes in the ends, which is laid across a raft of logs. Rafting pins are driven through the holes into the logs, thus holding the raft together. (N. F.)
- Lodge, to.** *See* Hang up, to.
- Logan, n.** *See* Pokelogan.

**Log deck.** The platform upon a loading jack. (Gen.)

**Log dump.** *See* Landing.

**Log fixer.** *See* Rosser.

**Logger, n.** One engaged in logging.

**Logging sled.** The heavy double sled used to haul logs from the skidway or yard to the landing. (N. F.)

Syn.: twin sleds, two sleds, wagon sled.

**Logging-sled road.** A road, leading from the skidway to the landing. (N. F.)

**Logging wheels.** A pair of wheels, usually about 10 feet in diameter, for transporting logs. (Gen.)

Syn.: big wheels, katydid, timber wheels.

**Log jack.** *See* Gangway.

**Log scale.** The contents of a log, or of a number of logs considered collectively. (Gen.)

**Log, to.** To cut logs and deliver them at a place from which they can be transported by water or rail, or, less frequently, at the mill. (Gen.)

**Log watch.** *See* Head driver.

**Logway, n.** *See* Gangway.

**Long butt, to.** *See* Butt off, to.

**Loose-tongued sloop.** *See* Swing dingle.

**Labber lift, to.** To raise the end of a log by means of a pry, and through the use of weight instead of strength. (N. F.)

**Lug hooks.** A pair of tongs attached to the middle of a short bar, and used by two men to carry small logs. (Gen.)

**Lumber, v.** To log, or to manufacture logs into lumber, or both. (Gen.)

**Lumberjack, n.** One who works in a logging camp. (Gen.)

**Lumberman, n.** One engaged in lumbering. (Gen.)

**Mark, n.** A letter or sign indicating ownership, which is stamped on the ends of logs. (Gen.) *See* Bark mark.

Syn.: brand, end mark.

**Mark caller.** In sorting logs, one who stands at the lower end of the sorting jack and calls the different marks, so that the logs may be guided into the proper channels or pockets. (Gen.)

**Marker, n.** One who puts the mark on the end of logs. (Gen.)

**Market, n.** A log 19 inches in diameter at the small end and 13 feet long. (New York.)

Syn.: standard.

**Marking hammer.** A hammer bearing a raised device which is stamped on logs, to indicate ownership. (Gen.)

Syn.: marking iron.

**Marking iron.** *See* Marking hammer.

**Match, v.** *See* Mate.

**Mate, v.** To place together in a raft logs of similar size. (Gen.)

Syn.: match.

**Mill pond.** The pond near a sawmill in which logs to be sawn are held. (Gen.)

**Monitor.** *See* Catamaran.

**Moss, v.** To fill with moss the crevices between the logs in a logging camp. (N. F.)

**Mud, v.** To fill with soft clay the crevices between the logs in a logging camp. (N. F.)

- Mudboat, n.** A low sled with wide runners, used for hauling logs in swamps. (S. F., N. F.)
- Mudsill, n.** The bed piece or bottom timber of a dam which is placed across the stream, usually resting on rocks or in mud. (Gen.)  
Syn.: bottom sill.
- Nick, n.** *See* Undercut.
- Nose, v.** To round off the end of a log in order to make it drag or slip more easily. (Gen.)  
Syn.: snipe.
- Notch, v.** To make an undercut in a tree preparatory to felling it. (Gen.)  
Syn.: undercut.
- Notch, n.** *See* Undercut.
- Peaker, n.** 1. A load of logs narrowing sharply toward the top, and thus shaped like an inverted V. (Gen.)  
2. The top log of a load. (Gen.)
- Peavey, n.** A stout lever 5 to 7 feet long, fitted at the larger end with a metal socket and pike and a curved steel hook which works on a bolt; used in handling logs, especially in driving. A peavey differs from a cant hook in having a pike instead of a toe ring and lip at the end. (Gen.)
- Pecky, a.** A term applied to an unsoundness most common in bald cypress. (S. F.)  
Syn.: peggy.
- Peeler, n.** *See* Barker.
- Peggy, a.** *See* Pecky.
- Pickaroon, n.** A piked pole fitted with a curved hook, used in holding boats to jams in driving, and for pulling logs from brush and eddies out into the current. (Gen.)
- Pick the rear, to.** *See* Sack the rear, to.
- Pier dam.** A pier built from the shore, usually slanting downstream, to narrow and deepen the channel, to guide logs past an obstruction, or to throw all the water on one side of an island. (N. F.)  
Syn.: wing dam.
- Pig, n.** *See* Rigging sled.
- Pig tail.** An iron device driven into trees or stumps to support a wire or small rope. (P. C. F.)
- Pike pole.** A piked pole, 12 to 20 feet long, used in river driving. (Gen.)
- Pitch pocket.** A cavity in wood filled with resin. (P. C. F., R. M. F.)
- Pitch streak.** A seam or shake filled with resin. (Gen.)
- Plug and knock down.** A device for fastening boom sticks together, in the absence of chains. It consists of a withe secured by wooden plugs in holes bored in the booms. (N. F.)
- Pocket boom.** A boom in which logs are held after they are sorted. (Gen.)
- Point, v.** *See* Gun.
- Pokelogan, n.** A bay or pocket into which logs may float off during a drive. (N. W., L. S.)  
Syn.: logan.
- Pond man.** One who collects logs in the mill pond and floats them to the gangway. (Gen.)
- Pontoon.** *See* Catamaran.

**Prize logs.** Logs which come to the sorting jack without marks denoting ownership. (N. F.)

**Pull back.** *See* Haul back.

**Pull boat.** A flatboat, carrying a steam skidder or a donkey, used in logging cypress. (S. F.)

**Pull the briar, to.** To use a crosscut saw. (N. F.)

**Put in, to.** In logging, to deliver logs at the landing. (Gen.)

**Quickwater, *n.*** That part of a stream which has fall enough to create a decided current. (Gen.)

Ant.: stillwater.

**Rafter dam.** A dam in which long timbers are set on the upstream side at an angle of 20 to 40 degrees to the water surface. The pressure of the water against the timbers holds the dam solidly against the stream bed. (N. F.)

Syn.: self-loading dam, slant dam.

**Ram pike.** A tree broken off by wind and with a splintered end on the portion left standing. (N. F.)

**Rank, *v.*** To haul and pile regularly, as, to *rank* bark or cord wood. (Gen.)

**Ranking bar.** *See* Handbarrow.

**Ranking jumper.** A wood-shod sled upon which tanbark is hauled. (N. F.)

**Rave, *n.*** A piece of iron or wood which secures the beam to the runners of a logging sled. (N. W., L. S.)

**Rear, *n.*** The upstream end of a drive; the logs may be either stranded or floating. "Floating rear" comprises those logs which may be floated back into the current; "dry rear," those which must be dragged or rolled back. (Gen.)

**Receiving boom.** *See* Storage boom.

**Ride, *n.*** The side of a log upon which it rests when being dragged. (Gen.)

**Ride a log, to.** To stand on a floating log. (Gen.)

**Rigging, *n.*** The cables, blocks, and hooks used in skidding logs by steam power. (Gen.)

**Rigging sled.** A sled used to haul hooks and blocks on a skid road. (P. C. F.)

Syn.: dog boat, pig.

**Rigging slinger. 1.** A member of a yarding crew, whose chief duty is to place chokers or grabs on logs. (P. C. F.)

2. One who attaches the rigging to trees, in steam skidding. (S. F.)

**Ring, *n.*** A section of tanbark, usually 4 feet long. (N. F.)

**Ring rot.** Decay in a log, which follows the annual rings more or less closely. (Gen.)

**Rise, *n.*** The difference in diameter, or taper, between two points in a log. (Gen.)

**River boss.** The foreman in charge of a log drive. (N. F.)

**River driver.** One who works on a log drive. (Gen.)

**River rat.** A log driver whose work is chiefly on the river; contrasted with Laker. (N. F.)

**Road donkey.** A donkey engine mounted on a heavy sled, which drags logs along a skid road by winding a cable on a drum. It has a second drum for the haul-back. (P. C. F.)

**Road gang.** That portion of the crew of a logging camp who cut out logging roads and keep them in repair. (N. F.)

**Road monkey.** One whose duty is to keep a logging road in proper condition. (N. W., L. S.)

Syn.: blue jay, greaser. (P. C. F.)

**Roll, n.** The crossbar of a logging sled into which the tongue is set. (N. W., L. S.)

Syn.: roller.

**Roller, n.** *See* Roll; Upright roller.

**Rolling dam.** A dam for raising the water in a shallow stream. It has no sluiceways, but a smooth top of timber over which, under a sufficient head of water, logs may slide or roll. (Gen.)

**Roll the boom, to.** To roll a boom of logs along the shore of a lake against which it is held by wind, by the use of a cable operated by a steamboat or kedge. The cable is attached to the outer side of the boom, hauled up, then attached again, thus propelling the boom by revolving it against the shore when it would be impossible to tow it. (N. W., L. S.)

**Rollway, n.** *See* Landing.

**Rooster, n.** *See* Gooseneck.

**Rosser, n.** One who barks and smooths the ride of a log in order that it may slide more easily. (N. F.)

Syn.: log fixer (P. C. F.), slipper, scalper (App.).

**Rough and tumble landing.** *See* Landing.

**Round timber.** Pine trees which have not been turpented. (S. F.)

**Round turn.** A space at the head of a logging-sled road, in which the sled may be turned round without unhitching the team. (N. F.)

**Runner chain.** A chain bound loosely around the forward end of the runners of a logging sled as a brake. (N. W., L. S.)

**Runner dog.** A curved iron attached to a runner of the hind sled of a logging sled, which holds the loaded sled on steep hills by being forced into the bed of the road by any backward movement. (N. F.)

**Runway.** *See* Gutter road.

**Rutter, n.** A form of plow for cutting ruts in a logging road for the runners of the sleds to run in. (N. W., L. S.)

**Sack the rear, to.** To follow a drive and roll in logs which have lodged or grounded. (Gen.)

Syn.: pick the rear, to.

**Sack the slide, to.** To return to a slide logs which have jumped out. (Gen.)

**Saddle, n.** The depression cut in a transverse skid in a skid road to guide the logs which pass over it. (P. C. F.)

**Saddlebag, v.** As applied to a boom, to catch on an obstruction and double around it. (Gen.)

**Sampson, n.** An appliance for loosening or starting logs by horsepower. It usually consists of a strong, heavy timber and a chain terminating in a heavy swamp hook. The timber is placed upright beside the piece to be moved, the chain fastened around it, and the hook inserted low down on the opposite side. Leverage is then applied by a team hitched to the upper end of the upright timber. (N. F.)

**Sampson a tree, to.** To direct the fall of a tree by means of a lever and pole. (N. F.)

**Sap stain.** Discoloration of the sapwood. (Gen.)

**Saw fitter.** *See* Filer.

**Sawyer, *n.*** *See* Faller.

**Scale book.** A book especially designed for recording the contents of scaled logs.  
(Gen.)

**Scaler, *n.*** One who determines the volume of logs. (Gen.)

**Scalper, *n.*** *See* Rosser.

**Scoot, *n.*** *See* Dray.

**Season check.** *See* Check.

**Second faller.** The subordinate in a crew of fallers. (P. C. F.)  
Syn.: helper. (N. F.)

**Self-loading dam.** *See* Rafter dam.

**Send-up man.** That member of a loading crew who guides the logs up the skids.  
(Gen.)

Syn.: ground loader. (N. F.)

**Send up, to.** In loading, to raise logs up skids with cant books, or by steam or horse power. (Gen.)

**Setting, *n.*** The temporary station of a portable sawmill, a yarding engine, or other machine used in logging. (Gen.)

**Shake, *n.*** A crack in timber, due to frost or wind. (Gen.)  
Syn.: Windshake.

**Shanty boat.** *See* Wanigan.

**Shanty boss.** *See* Chore boy.

**Shear boom.** A boom so secured that it guides floating logs in the desired direction.  
(N. F.)

Syn.: fender boom, glancing boom.

**Shear skid.** *See* Fender skid.

**Shoot a jam, to.** To loosen a log jam with dynamite. (Gen.)

**Shore hold.** The attachment of the hawser of a raft of logs to an object on the shore. (N. W., L. S.)

**Short road.** *See* Go-back road.

**Shot holes.** Holes made in wood by boring insects. (App.)

**Side jam.** A jam which has formed on one side of a stream, usually where the logs are forced to the shore at a bend by the current, or where the water is shallow or there are partially submerged rocks. (N. F.)

**Side mark.** *See* Bark mark.

**Side winder.** A tree knocked down unexpectedly by the falling of another.  
(Gen.)

**Signal man.** One who transmits orders from the foreman of a yarding crew to the engineer of the yarding donkey. (P. C. F.)

**Single out, to.** To float logs, usually cypress, one at a time, from the woods to the float road. (S. F.)

**Sinker, *n.*** *See* Deadhead.

**Sinker boat.** *See* Catamaran.

**Skid, *v.*** 1. To draw logs from the stump to the skidway, landing, or mill. (Gen.)  
Syn.: snake, twitch.

2. As applied to a road, to reenforce by placing logs or poles across it. (Gen.)

**Skid, *n.*** A log or pole, commonly used in pairs, upon which logs are handled or piled (Gen.); or the log or pole laid transversely in a skid road (P. C. F.).



**Skidder, n.** 1. One who skids logs. (Gen.)

2. A steam engine, usually operating from a railroad track, which skids logs by means of a cable. (Gen.)

Syn.: steam skidder.

3. The foreman of a crew which constructs skid roads. (P. C. F.)

4. *See* Bummer.

**Skidding chain.** A heavy chain used in skidding logs. (Gen.)

**Skidding hooks.** *See* Skidding tongs.

**Skidding sled.** *See* Dray.

**Skidding tongs.** A pair of hooks attached by links to a ring and used for skidding logs. (Gen.)

Syn.: grips, grapples, grabs, skidding hooks.

**Skidding trail.** *See* Gutter road.

**Skid grease.** A heavy oil applied to skids to lessen the friction of logs dragged over them. (P. C. F.)

**Skid road.** 1. A road or trail leading from the stump to the skidway or landing. (Gen.)

Syn.: travois road. (N. F.)

2. A road over which logs are dragged, having heavy transverse skids partially sunk in the ground, usually at intervals of about 5 feet. (P. C. F.)

**Skid up, to.** 1. To level or reenforce a logging road by the use of skids. (Gen.)

2. To collect logs and pile them on a skidway. (Gen.)

**Skidway, n.** Two skids laid parallel at right angles to a road, usually raised above the ground at the end nearest the road. Logs are usually piled upon a skidway as they are brought from the stump for loading upon sleds, wagons, or cars. (Gen.)

**Skidway, to break a.** To roll piled logs off a skidway. (Gen.)

**Sky hooker.** *See* Top loader.

**Slack water.** In river driving, the temporary slackening of the current caused by the formation of a jam. (Gen.)

**Slant dam.** *See* Rafter dam.

**Slash, n.** 1. The *débris* left after logging, wind, or fire. (Gen.)

Syn.: slashing.

2. Forest land which has been logged off and upon which the limbs and tops remain, or which is deep in *débris* as the result of fire or wind. (Gen.)

**Slashing, n.** *See* Slash.

**Sled tender.** 1. One who assists in loading and unloading logs or skidding with dray. (N. F.)

Syn.: chain tender.

2. A member of the hauling crew who accompanies the turn of logs to the landing, unbooks the grabs, and sees that they are returned to the yarding engine. (P. C. F.)

**Slide, n.** A trough built of logs or timber, used to transport logs down a slope. (Gen.)

Syn.: chute, dry slide, slip.

**Slide tender.** One who keeps a slide in repair. (Gen.)

**Slip, n.** 1. *See* Slide.

2. *See* Gangway.

**Slip grab.** A pear-shaped link attached by a swivel to a skidding evenor or whittle-tree, through which the skidding chain is passed. The chain runs freely when the slip grab is held sideways, but catches when the grab is straight. (N. F.)

Syn.: grab link.

**Slipper, n.** See Rosser.

**Slip skids.** See Glisse skids.

**Sloop, n.** See Dray.

**Sloop logs, to.** To haul logs down steep slopes on a dray or sloop equipped with a tongue. (N. F.)

**Slough pig.** Usually a second-rate river driver who is assigned to picking logs out of sloughs in advance of the rear. (N. F.)

**Sluice, v.** 1. See Flume.

2. To float logs through the sluiceway of a splash dam. (N. F.)

3. See Splash.

**Sluice, n.** See Flume.

**Sluice gate.** The gate closing a sluiceway in a splash dam. (Gen.)

**Sluiceway, n.** The opening in a splash dam through which logs pass. (Gen.)

**Snake, v.** See Skid.

**Snaking trail.** See Gutter road.

**Snatch team.** See Tow team.

**Snib, v.** In river driving, to be carried away purposely, but ostensibly by accident, on the first portion of a jam that moves; to ride away from work under guise of being accidentally carried off. (N. W., L. S.)

**Snipe, v.** See Nose.

**Sniper, n.** One who noses logs before they are skidded. (Gen.)

**Snow a road, to.** To cover bare spots in a logging road with snow, to facilitate the passage of sleds. (N. F.)

**Snow slide.** A temporary slide on a steep slope, made by dragging a large log through deep snow which is soft or thawing; when frozen solidly, it may be used to slide logs to a point where they can be reached by sleds. (N. W.)

**Snub, v.** To check, usually by means of a snub line, the speed of logging sleds or logs on steep slopes, or of a log raft. (Gen.)

**Softwood, a.** As applied to trees and logs, needle-leaved, coniferous. (Gen.)

**Softwood, n.** A needle-leaved, or coniferous, tree. (Gen.)

**Solid jam.** 1. In river driving, a jam formed solidly and extending from bank to bank of a stream. (N. F.)

2. A drive is said to be "in a solid jam" when the stream is full of logs from the point to which the rear is cleared to the mill, sorting jack, or storage boom. (N. F.)

**Sorting boom.** A strong boom used to guide logs into the sorting jack, to both sides of which it is usually attached. (Gen.)

**Sorting gap.** See Sorting jack.

**Sorting jack.** A raft, secured in a stream, through an opening in which logs pass to be sorted by their marks and diverted into pocket booms or the downstream channel. (Gen.)

Syn.: sorting gap.

**Spanish windlass.** A device for moving heavy objects in logging. It consists of a rope or chain, within a turn of which a lever is inserted and power gained by twisting. (N. F.)

Syn.: twister.

**Spiked skid.** A skid in which spikes are inserted in order to keep logs from sliding back when being loaded or piled. (Gen.)

**Splash, v.** To drive logs by releasing a head of water confined by a splash dam. (Gen.)

Syn.: flood, sluice.

**Splash boards.** Boards placed temporarily on top of a rolling dam to heighten the dam, and thus to increase the head of water available for river driving. (N. F.)

**Splash dam.** A dam built to store a head of water for driving logs. (Gen.)

Syn.: flood dam. (Gen.)

**Split roof.** A roof of a logging camp or barn made by laying strips split from straight-grained timber. The strips run from the ridge pole to the eaves, and break the joints with other strips, as in a shingle roof. (N. F.)

**Spool donkey.** A donkey engine for winding cable, equipped with a spool or capstan, instead of a drum. (P. C. F.)

**Spool tender.** One who guides the cable on a spool donkey. (P. C. F.)

**Spot, v.** See Blaze.

**Spring board.** A short board, shod at one end with an iron calk, which is inserted in a notch cut in a tree, on which the faller stands while felling the tree. (P. C. F., S. F.)

**Spring pole.** 1. A springy pole attached to the tongue of a logging sled and passing over the roll and under the beam, for holding the weight of the tongue off the horses' necks. (N. F.)

2. A device for steadying a crosscut saw, so that one man can use it instead of two. (P. C. F.)

**Sprinkler, n.** A large wooden tank from which water is sprinkled over logging roads during freezing weather in order to ice the surface. (N. W., L. S.)

Syn.: tank.

**Sprinkler sleds.** The sleds upon which the sprinkler is mounted. They consist of two sleds whose runners turn up at each end, fastened together by cross chains, and each having a pole, in order that the sprinkler may be hauled in either direction without turning around. (N. F.)

**Spud, n.** A tool for removing bark. (Gen.)

Syn.: barking iron.

**Spudder, n.** See Barker.

**Stag, v.** To cut off trousers at the knee, or boots at the ankle. (N. F., P. C. F.)

**Standard, n.** See Market.

**Starting bar.** See Gee throw.

**Stay boom.** A boom fastened to a main boom and attached upstream to the shore to give added strength to the main boom. (Gen.)

**Steam hauler.** A geared locomotive used to haul loaded logging sleds over an ice road. It is equipped with a spiked metal belt which runs over sprocket wheels replacing the driving wheels, and is guided by a sled, turned by a steering wheel, upon which the front end rests. (N. F.)

**Steam jammer.** See Steam loader.

**Steam loader.** A machine operated by steam and used for loading logs upon cars. (Gen.)

Syn.: loader, steam jammer.

**Steam skidder.** See Skidder.

**Stem winder.** See Corkscrew.

**Stillwater.** That part of a stream having such slight fall that no current is apparent. Ant.: quickwater. (Gen.)

Syn.: deadwater.

**Stock logs, to.** To deliver logs from stump to mill or railroad. (S. F.)

**Storage boom.** A strong boom used to hold logs in storage at a sawmill. (Gen.)

Syn.: holding boom, receiving boom.

**Straw boss, n.** A subforeman in a logging camp. (N. W., L. S.)

Syn.: head push.

**Stream jam.** See Center jam.

**Stringer road.** See Fore-and-aft road.

**Stumpage, n.** The value of timber as it stands uncut in the woods; or, in a general sense, the standing timber itself. (Gen.)

**Swamp, v.** To clear the ground of underbrush, fallen trees, and other obstructions preparatory to constructing a logging road or opening out a gutter road. (Gen.)

**Swamper, n.** One who swamps. (Gen.)

Syn.: beaver, gutterman. (N. F.)

**Swamp hook.** A large, single hook on the end of a chain, used in handling logs, most commonly in skidding. (Gen.)

**Sway bar. 1.** A strong bar or pole, two of which couple and hold in position the front and rear sleds of a logging sled. (N. F.)

**2.** The bar used to couple two logging cars. (Gen.)

**Swell butted.** As applied to a tree, greatly enlarged at the base. (Gen.)

Syn.: bottle butted, churn butted.

**Swing, v.** See Gun.

**Swing dingle.** A single sled with wood-shod runners and a tongue with lateral play, used in hauling logs down steep slopes on bare ground. (N. F.)

Syn.: loose-tongued sloop.

**Swing team.** In a logging team of six, the pair between the leaders and the butt team. (P. C. F.)

**Tail chain.** A heavy chain bound around the trailing end of logs, as a brake, in sloping on steep slopes. (N. W.)

**Taildown, to.** To roll logs on a skidway to a point on the skids where they can be quickly reached by the loading crew. (N. F.)

**Tail hold. 1.** A means of obtaining increased power in moving a log by tackle. The cable is passed through a block attached to the log and the end fastened to a stationary object, so that hauling on the other end gives twice the power which would be attained by direct attachment of the cable to the log. (P. C. F.)

**2.** The attachment of the rear end of a donkey sled, usually to a tree or stump. (P. C. F.)

**Tail hook.** See Dog.

**Tally board.** A thin, smooth board used by a scaler to record the number or volume of logs. (Gen.)

**Tally man.** One who records or tallies the measurements of logs as they are called by the scaler. (N. F.)

**Tank, n.** See Sprinkler.

**Tank conductor.** One who has charge of the crew which operates a sprinkler or tank, and who regulates the flow of water, in icing logging roads. (N. F.)

**Tank heater.** A sheet-iron cylinder extending through a tank or sprinkler, in which a fire is kept to prevent the water in the tank from freezing while icing logging roads in extremely cold weather. (N. F.)

- Tanking.** The act of hauling water in a tank, to ice a logging road. (N. F.)
- Tee, n.** A strip of iron about 6 inches long with a hole in the center, to which a short chain is attached; it is passed through a hole in a gate plank, turned crosswise, and so used to hold the plank when tripped in a splash dam. (N. W.)
- Throw, v.** *See* Wedge a tree, to.
- Throw line.** *See* Trip line.
- Throw out.** *See* Frog.
- Tide, n.** A freshet. In the Appalachian region logs are rolled into a stream and a "tide" awaited to carry them to the boom. (App.)
- Timber wheels.** *See* Logging wheels.
- Toe ring.** The heavy ring or ferrule on the end of a cant hook. It has a lip on the lower edge to prevent slipping when a log is grasped. (Gen.)
- Toggle chain.** A short chain with a ring at one end and a toggle hook and ring at the other, fastened to the sway bar or bunk of a logging sled, and used to regulate the length of a binding chain. (N. F.)  
Syn.: bunk chain.
- Toggle hook.** A grab hook with a long shank, used on a toggle chain. (N. F.)
- Tonging, v.** Handling logs with skidding tongs. (N. F.)
- Top chains.** Chains used to secure the upper tiers of a load of logs after the capacity of the regular binding chains has been filled. (Gen.)
- Top load.** A load of logs piled more than one tier high, as distinguished from a bunk load. (Gen.)
- Top loader.** That member of a loading crew who stands on the top of a load and places logs as they are sent up. (Gen.)  
Syn.: sky hooker. (N. F.)
- Tote, v.** To haul supplies to a logging camp. (N. F.)
- Tote road.** A road used for hauling supplies to a logging camp. (N. F.)  
Syn.: hay road.
- Tote sled.** *See* Jumper.
- Tow team.** An extra team stationed at an incline in a logging road to assist the regular teams in ascending with loaded sleds. (N. F.)  
Syn.: snatch team.
- Trailers, n.** Several logging sleds hitched behind one another and pulled by 4 to 8 horses driven by one man, thus saving teamster's wages. (N. F.)
- Tram, n.** *See* Tramway.
- Tramway, n.** A light or temporary railroad for the transportation of logs, often with wooden rails and operated by horsepower. (Gen.)  
Syn.: tram.
- Travois, n.** *See* Dray.
- Travois road.** *See* Skid road.
- Trip, v.** *See* Wedge a tree, to.
- Trip, n.** *See* Turn.
- Trip a dam, to.** To remove the plank which closes a splash dam. (N. F.)
- Trip line.** 1. A light rope attached to a dog hook, used to free the latter when employed in breaking a jam, a skidway, or a load. (N. F.)  
Syn.: throw line.  
2. *See* Haul back.
- Tripsill, n.** A timber placed across the bottom of the sluiceway in a splash dam, against which rest the planks by which the dam is closed. (Gen.)

**Trough roof.** A roof on a logging camp or barn, made of small logs split lengthwise, hollowed into troughs and laid from ridge pole to eaves. The joints of the lower tier are covered by inverted troughs. (N. F.)

**Turkey, *n.*** A bag containing a lumberjack's outfit. To "histe the turkey" is to take one's personal belongings and leave camp. (N. W., L. S.)

**Turn, *n.*** 1. A single trip and return made by one team in hauling logs—e. g., a four-turn road is a road the length of which will permit of only four round trips per day. (N. F.)

Syn.: trip. (Gen.)

2. Two or more logs coupled together end to end for hauling. (P. C. F.)

**Turnout, *n.*** A short side road from a logging-sled road, to allow loaded sleds to pass. (N. W., L. S.)

**Twin sleds.** See Logging sled.

**Twister, *n.*** See Spanish windlass.

**Twitch, *v.*** See Skid.

**Two sleds.** See Logging sled.

**Undercut, *v.*** See Notch.

**Undercut, *n.*** The notch cut in a tree to determine the direction in which the tree is to fall, and to prevent splitting. (Gen.)

Syn.: notch (Gen.), nick (S. F.).

**Undercutter, *n.*** A skilled woodman who chops the undercut in trees so that they shall fall in the proper direction. (Gen.)

**Union drive.** A drive of logs belonging to several owners, who share the expense pro rata. (N. F.)

**Upright roller.** A flanged roller placed upright at a bend in a skid road to direct the cable. (P. C. F.)

Syn.: roller, dolly.

**Value, *v.*** See Cruise.

**Valuer, *n.*** See Cruiser.

**Van, *n.*** The small store in a logging camp in which clothing, tobacco, and medicine are kept to supply the crew. (N. W., L. S.) See Commissary.

**Wagon sled.** See Logging sled.

**Wanigan, *n.*** A houseboat used as sleeping quarters or as kitchen and dining room by river drivers. (N. W., L. S.)

Syn.: ark (N. F.), shanty boat (S. F.).

**Water ladder.** Pole guides up and down which a barrel slides in filling a sprinkler by horsepower. (N. W., L. S.)

**Water slide.** See Flume.

**Wedge a tree, *to.*** To topple over with wedges a tree that is being felled. (Gen.)

Syn.: throw, trip.

**Wet slide.** See Flume.

**Whiffletree neckyoke.** A heavy logging neckyoke, to the ends of which short whiffletrees are attached by rings. From the ends of the whiffletrees wide straps run to the breeching, thus giving the team added power in holding back loads on steep slopes. (N. F.)

**White water man.** A log driver who is expert in breaking jams on rapids or falls. (N. F.)

**Widow maker.** A broken limb hanging loose in the top of a tree, which in its fall may injure a man below (N. F.), or a breaking cable (P. C. F.).

**Wigwam, to make a.** In felling trees, to lodge several in such a way that they support each other. (N. F.)

**Windfall, *n.*** An area upon which the trees have been thrown by wind; also, a single tree thrown by wind. (Gen.)

Syn.: blow down, wind slash. (N. F.)

**Windshake, *n.*** *See* Shake.

**Wind slash.** *See* Windfall.

**Wing dam.** *See* Pier dam.

**Wing jam.** A jam which is formed against an obstacle in the stream and slants upstream until the upper end rests solidly against one shore, with an open channel for the passage of logs on the opposite side. (N. F.)

**Woodpecker, *n.*** A poor chopper. (Gen.)

**Wrapper chain.** *See* Binding chain.

**Yard, *n.*** *See* Landing.

**Yarding donkey.** A donkey engine mounted upon a heavy sled, used in yarding logs by drum and cable. (P. C. F.)





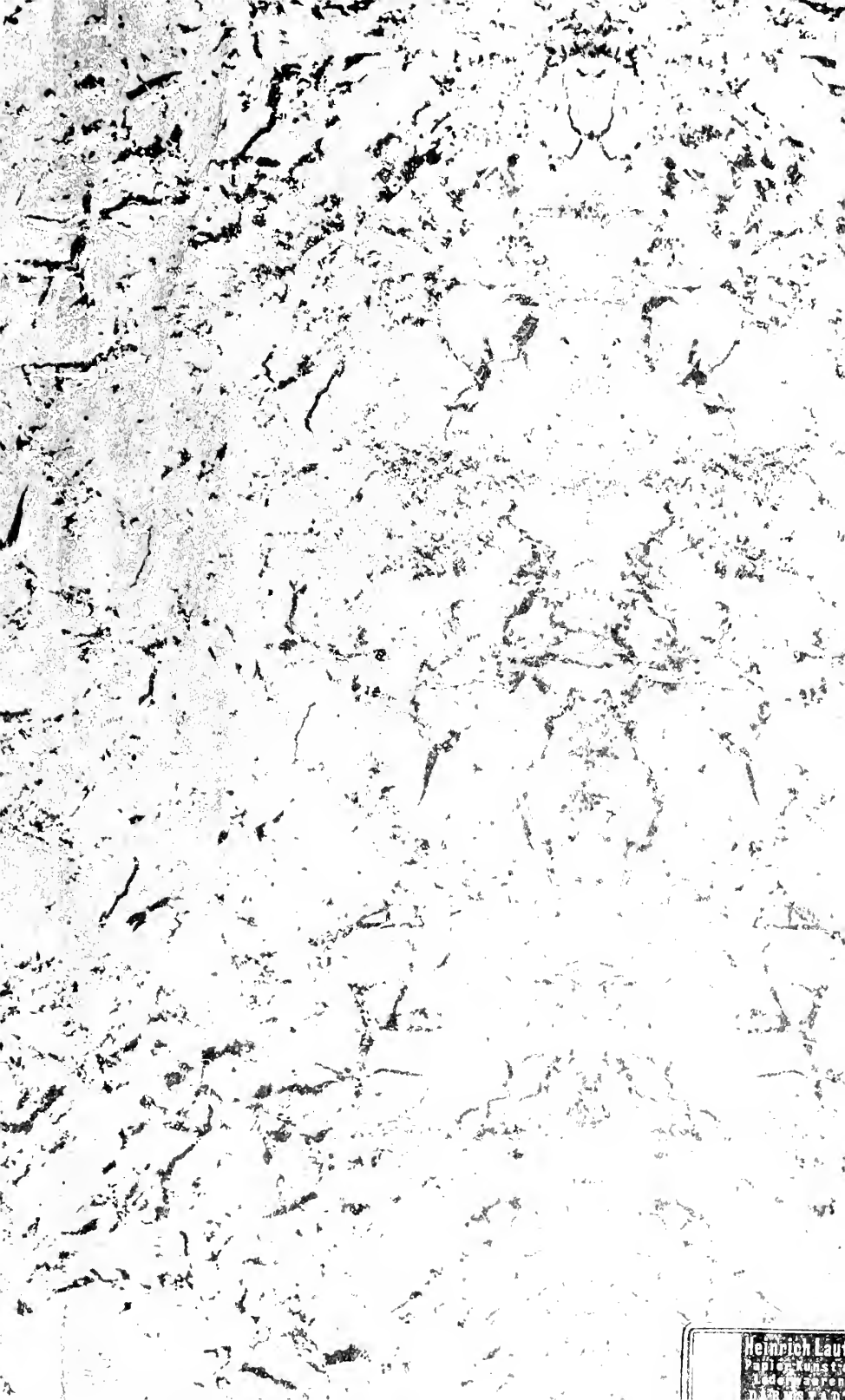












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